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Final

Expanded Remedial Investigation Human Health Risk Assessment Ecological Risk Assessment for Site 5

St. Juliens Creek Annex
Chesapeake, Virginia

Prepared for

Department of the Navy

Naval Facilities Engineering Command Atlantic

Contract No. N62470-02-D-3052
CTO-0024

June 2006

Prepared by

CH2MHILL

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Acronyms and Abbreviations

BAF	bioaccumulation factor
BCF	bioconcentration factor
BERA	Baseline Ecological Risk Assessment
bgs	below ground surface
BTAG	Biological Technical Assistance Group
BW	body weight
CDD	polychlorinated dibenzodioxin
CDF	polychlorinated dibenzofuran
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLEAN	Comprehensive Long-Term Environmental Action Navy
COC	chemical of concern
COPC	chemical of potential concern
CSF	cancer slope factor
CT	central-tendency
CTO	Contract Task Order
DDD	dichlorodiphenyldi-chloroethane
DDE	dichlorodiphenyldichloro-ethene
DDT	dichlorodiphenyltrichloro-ethane
DL	detection limit
DNH	Division of Natural Heritage
DO	dissolved oxygen
DRMO	Defense Reutilization and Marketing Office
EE/CA	Engineering Evaluation/Cost Analysis
EPA	United States Environmental Protection Agency
EPC	exposure point concentration
EPIC	Environmental Photographic Interpretation Center
ERA	ecological risk assessment
ERI	Expanded Remedial Investigation
FS	Feasibility Study
HHRA	Human Health Risk Assessment
HI	hazard index
HQ	hazard quotient
HEAST	Health Effects Assessment Tables
HRS	Hazard Ranking System
IAS	Initial Assessment Study
IEUBK	Integrated Exposure Uptake Biokinetic
IRIS	Integrated Risk Information System
IRP	Installation Restoration Program

LD_{50}	lethal dose
LOAEL	Lowest Observed Adverse Effect Level
MARMC	Mid-Atlantic Regional Maintenance Center
MCL	Maximum Contaminant Level
MEC	munitions and explosives of concern
mg/kg	milligrams per kilogram
MS/MSD	matrix spike/matrix spike duplicates
msl	mean sea level
MVUE	minimum variance unbiased estimator
NCEA	National Center for Environmental Assessment
NOAEL	No Observed Adverse Effect Level
NTCRA	non-time-critical removal action
ORP	oxidation-reduction potential
OSWER	Office of Solid Waste and Emergency Response
PA	Preliminary Assessment
PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyls
PPRTV	Provisional Peer-Reviewed Toxicity Values
QA/QC	quality assurance/quality control
QC	quality control
RAO	remedial action objectives
RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act
RDA	Recommended Dietary Allowance
RDX	Research Development Explosive
RFA	RCRA Facility Assessment
RfD	reference dose
RI	Remedial Investigation
RME	reasonable maximum exposure
RRR	Relative Risk Ranking
SERA	Screening Ecological Risk Assessment
SF	slope factor
SJCA	St. Juliens Creek Annex
SPAWAR	Space and Naval Warfare Systems Command
SWMU	Solid Waste Management Unit
SVOC	semivolatile organic compound
TAL	Target Analyte List
TCL	Target Compound List
TCLP	Toxicity Leaching Characteristic Procedure
TEF	toxicity equivalency factor
TEQ	toxic equivalency
TNT	trinitrotoluene

UCL	upper confidence limit
UF	uncertainty factor
µg/dL	micrograms per deciliter
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
UTL	upper tolerance level
UU/UE	unlimited use and unrestricted exposure
UXO	unexploded ordnance
VDEQ	Virginia Department of Environmental Quality
VOC	volatile organic compound

SECTION 1

Introduction

This report presents data, results, and conclusions of the Expanded Remedial Investigation (ERI) conducted at Site 5 (Burning Grounds), St. Juliens Creek Annex (SJCA), Chesapeake, Virginia. The locations of SJCA and Site 5 are shown on Figures 1-1 and 1-2, respectively.

A Remedial Investigation (RI)/Human Health Risk Assessment (HHRA)/Ecological Risk Assessment (ERA) report was completed in March 2003 (CH2M HILL, March 2003a). The RI/HHRA/ERA recommended that additional surface soil sampling be conducted to further characterize the nature and extent of contamination to evaluate remedial alternatives for Site 5. Additionally, groundwater samples collected at Site 5 during the RI/HHRA/ERA had isolated detections of several metals above the Federal Maximum Contaminant Levels (MCLs) in the shallow aquifer and one Research Development Explosive (RDX) detection in the deep aquifer. Therefore, the SJCA Project Management Team, which consists of representatives from the Navy, United States Environmental Protection Agency (EPA), and Virginia Department of Environmental Quality (VDEQ), concluded that an additional round of groundwater sampling was necessary to confirm or deny the previous results before proceeding with a more complete assessment of remedial needs.

This ERI report was prepared under the U.S. Navy, Naval Facilities Engineering Command, Mid-Atlantic, Comprehensive Long-Term Environmental Action Navy (CLEAN) III Contract N62470-02-D-3052, Contract Task Order (CTO) 0024, for submittal to the Navy, EPA, Region III , Virginia Department of Environmental Quality (VDEQ), and the SJCA Installation Restoration Program (IRP). The technical approach for the ERI was jointly scoped by the SJCA Project Management Team.

1.1 Objectives and Approach

The primary objective of the ERI was to further define the nature and extent of surface soil and groundwater contamination to support the evaluation of remedial alternatives for Site 5. In order to achieve the purpose of this ERI, the following objectives were identified:

- Evaluate results from the additional surface soil samples collected during the ERI to further define surface soil contamination and support the evaluation of potential remedial alternatives for Site 5;
- Evaluate groundwater sampling results collected during ERI activities to verify MCL exceedances in shallow groundwater and the presence of explosives in deep groundwater at Site 5; and
- Determine if Site 5 surface soil and shallow groundwater pose unacceptable human and ecological risks based on the ERI findings.

In addition to the data collected during the ERI, historical and RI/HHRA/ERA data were also evaluated in this ERI report in order to achieve the objectives.

1.2 Report Organization

This ERI report comprises the following sections:

- Section 1—Introduction
- Section 2—Background and Field Investigation Activities
- Section 3—Expanded Nature and Extent of Contamination
- Section 4—Human Health Risk Assessment Addendum
- Section 5—Ecological Risk Assessment Addendum
- Section 6— Conclusions and Recommendations
- Section 7— References

Figures and tables are provided at the end of each section following the text. Appendixes are provided at the end of the document.

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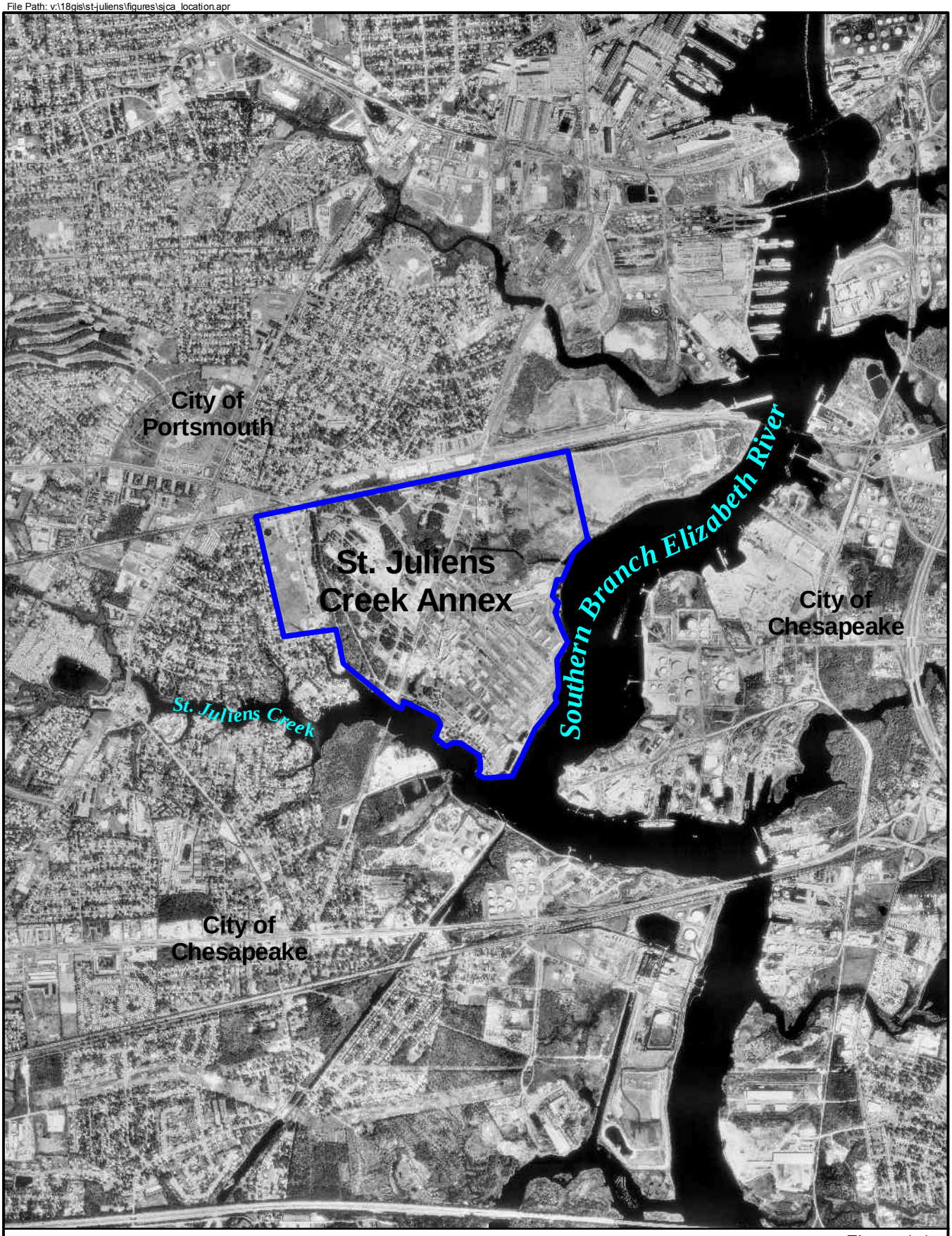

LEGEND

St. Juliens Creek Annex

N

0 2000 4000 Feet

Figure 1-1
Location of St. Juliens Creek Annex
Site 5 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

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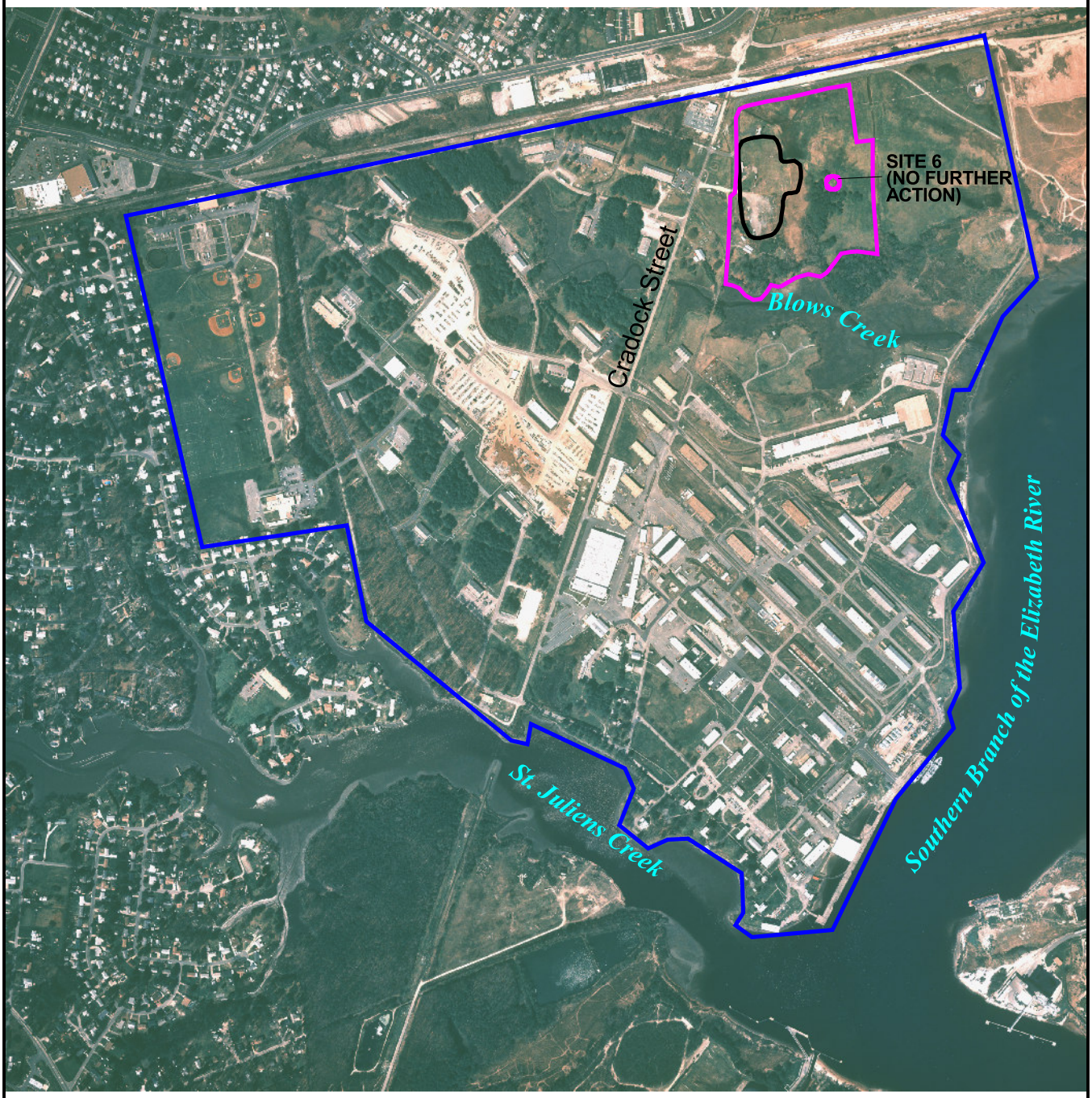

LEGEND

- Site 5 Waste/Burnt Soil Area
- Site 5 Boundary
- St. Juliens Creek Annex

N

0 500 1000 Feet

Figure 1-2
Location of Site 5
Site 5 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

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SECTION 2

Background and Field Investigation Activities

The SJCA and site descriptions, background information, summaries of previous basewide investigations, and summaries of site-specific investigations are included in this section.

2.1 SJCA Description and History

The SJCA facility is situated at the confluence of St. Juliens Creek and the Southern Branch of the Elizabeth River in the City of Chesapeake, located in southeastern Virginia (Figure 1-1). The facility covers approximately 490 acres.

The facility is bordered to the north by the Norfolk and Western Railroad, the City of Portsmouth, and residential areas; to the west by residential areas; to the south by St. Juliens Creek; and to the east by the Southern Branch of the Elizabeth River (Figure 1-2). Most of the surrounding areas are developed and include residences, schools, recreational area, and shipping facilities for several large industries. The Norfolk Naval Shipyard is located approximately 1.5 miles to the north.

SJCA began operations as a naval ammunition facility in 1849. In the past, operations at SJCA have included general ordnance operations involving wartime transfer of ammunitions to various other U.S. Naval facilities throughout the United States and abroad. In addition, the annex has been involved in specific ordnance operations and processes including those involving black powder operations, smokeless powder operations, projectile loading operations, mine loading, tracer mixing, testing operations, and decontamination operations. Decontamination was performed in, around, and under ordnance handling facilities at SJCA in 1977, after ordnance operations had ceased (NEESA, August 1981).

SJCA has also been involved in non-ordnance operations, including degreasing operations, paint shops, machine shops, vehicle and locomotive maintenance shops, pest control shops, battery shops, print shops, electrical shops, boiler plant operations, wash rack operations, potable water and salt water fire protection systems, fire training operations, and oil and chemical storage. Many of these operations have been discontinued, such as locomotive maintenance and printing.

Activity at SJCA has decreased in recent years and many of the aging structures are being demolished. The current primary mission of SJCA is to provide a radar testing range and various administrative and warehousing facilities for nearby Norfolk Naval Shipyard and other local naval activities. SJCA also provides administrative offices, light industrial shops, and storage facilities for several tenant commands; including Defense Reutilization and Marketing Office (DRMO) storage, Space and Naval Warfare Systems Command (SPAWAR), Mid-Atlantic Regional Maintenance Center (MARMC), and a cryogenics school.

2.2 Site 5 Description and History

Site 5 is the former Burning Grounds, consisting of approximately 21 acres located in the northeastern portion of SJCA (Figure 1-2). In earlier documents, Site 5 was also referred to as SWMU 8 and was reported to consist of approximately 3 acres. Recent investigation activities and review of historical accounts resulted in the site boundary revision. The revised boundary is depicted in figures presented herein. Review of historical aerial photographs indicate that prior to use as a disposal area, the site and much of the adjacent area had been used for placement of dredge spoil material that reportedly originated from Blows Creek and the Southern Branch of the Elizabeth River.

Operations began at the Burning Grounds in the 1930s when waste ordnance materials, including black powder (mixture of charcoal, nitrate, and sulfur), smokeless powder (nitrocellulose), Explosive D (ammonium picrate), and Composition A-3 (contains RDX and wax), were disposed of by open burning on three main pads. Tetryl, trinitrotoluene (TNT), fuzes, solvents, paint sludge, pesticides, and various types of refuse were also disposed. Reports stated that the Burning Grounds spontaneously caught fire several times in the 1970s. The amount of ordnance disposed varied from year to year and there is insufficient information to calculate the waste volume. Interviews conducted with former employees in December 2001 indicated that asbestos piping was buried 10 ft below ground surface (bgs) and that other material disposed included tables and metal from buildings. However, the RI waste delineation activities confirmed the presence of waste and burnt soil only to a depth of 26 inches bgs. In 1974, 427 tons of ordnance items were reportedly disposed at the site.

In mid-1977, the Burning Grounds surface was used for facility-wide ordnance equipment and material decontamination. The decontamination process included filling equipment from buildings with oil and straw and igniting it. Afterwards, the ground surface was reportedly covered with oil and straw and burned. The top 6 inches of soil was then diced, and the ground surface was covered with oil and straw and burned again. After the decontamination was completed, the Naval Ammunition Production Engineering Center (NAPEC) collected samples for chemical analyses and certified decontamination; however, the level of decontamination was not specified.

The site currently consists of an open field with a wetland in the central portion and a forested area in the southern portion (Figure 2-1). A significant portion of the site's southwestern area is covered with a layer of gravel. The Site 5 topography slopes gently toward Blows Creek, ranging in elevation from 8 ft above mean sea level (amsl) in the northern portion to 0 ft amsl in the southern portion of the site at Blows Creek. Groundwater flow follows the topography and flows toward Blows Creek. One to 3 feet (ft) deep vegetated drainage ditches are located along the perimeters of the site and discharge surface water runoff to Blows Creek, reducing runoff onto the site from adjacent areas.

Site 6, located within the east-central portion of Site 5, is a former IRP site that was closed under a no action Record of Decision in September of 2003 after a non-time-critical removal action (NTCRA) conducted in September of 2002. Following the NTCRA activities at Site 6, the area beyond the limits of the Site 6 excavation was recommended to be included in future supplemental investigations at Site 5 (CH2M HILL, March 2003b). Therefore, the samples SJS05-SS36 through -SS39 were incorporated and are reported as part of the ERI.

2.3 Previous Basewide and Site-Specific Investigations

2.3.1 Basewide Investigations

Previous basewide investigations conducted at SJCA related to Site 5 are listed below. A more detailed description of these activities is located in the RI/HHRA/ERA for Site 5 (CH2M HILL, March 2003a).

- Initial Assessment Study (IAS) – 1981
- Preliminary Assessment (PA) – 1983
- Phase II RCRA Facility Assessment (RFA) – 1989
- Environmental Photographic Interpretation Center (EPIC) Study and Regulatory Review – 1995
- Relative Risk Ranking (RRR) System Data Collection Report – 1996
- Hazard Ranking System (HRS) – 1999

2.3.2 Site-Specific Investigations

Remedial Investigation/Human Health Risk Assessment/Ecological Risk Assessment - March 2003

The objective of the RI/HHRA/ERA for Site 5 completed in March 2003 was to define the nature and extent of soil, groundwater, sediment, and surface water contamination to an extent sufficient for a Feasibility Study (FS), to evaluate the geologic and hydrogeologic systems at the site to further understand contaminant distribution, to identify potential contaminant migration pathways, and to determine if Site 5 poses unacceptable human and ecological risks. Figure 2-2 shows the RI sample locations.

The extent of waste at Site 5 was determined visually during trenching activities. Burnt soils (friable black silty sand) and construction debris characterize the waste at Site 5. In addition, munitions and explosives of concern (MEC) scrap have been identified at the site: Two spent ordnance were found, including a spent percussion primer and a Mark 7 cartridge case. Construction debris consisted of material including wires, ceramics, brass, glass, and wood. Debris was generally located within the first 16 inches (in.) and burnt/stained soils were identified to a depth of no more than 26 in. below ground surface (bgs). A sample of waste was analyzed for Toxicity Characteristic Leaching Procedure (TCLP) metals and organics and was found to be non-hazardous.

Primary fate and contaminant migration pathways at Site 5 include surface runoff and erosion of soil to the drainage ditches and the wetland, and infiltration and leaching of precipitation through the vadose zone from soil to the groundwater system.

The RI/HHRA/ERA concluded that there is potential risk to human receptors from exposure to chemicals in soil and upland drainage ditch sediment (primarily metals, pesticides, and polycyclic aromatic hydrocarbons [PAHs]). Because surface water is transient at the site and the upland ditches provide minimal ecological habitat, there is no significant risk to human health and the environment identified from direct exposure to surface water. Groundwater

samples collected from shallow monitoring wells at Site 5 indicated isolated detections of metals at concentrations above MCLs. In addition, an isolated detection of RDX was found in a sample collected from a deep monitoring well. The RI did not identify any human health risks in shallow groundwater; however, only the construction worker scenario was evaluated. Surface soil sampling was recommended to evaluate remedial alternatives for Site 5. Additionally, the Project Management Team agreed that a revised HHRA should be completed for groundwater to assess potential risk to hypothetical future residents.

A separate Baseline Ecological Risk Assessment (BERA) for Blows Creek was recommended and later conducted to identify potential risk associated with possible historical contributions to Blows Creek from upland Navy IRP sites. The BERA also encompasses the wetland just south of Site 5.

2.4 Expanded Remedial Investigation Field Activities

The ERI field activities included surface soil and groundwater sampling completed in December 2003 as described below. All activities were conducted in accordance with the objectives defined in the Work Plan (CH2M HILL, December 2003). A summary of the surface soil and groundwater samples collected to-date at Site 5, including the RI samples, is provided on Table 2-1.

Appropriate quality assurance/quality control (QA/QC) sampling was performed according to Navy CLEAN and CH2M HILL protocol, including field blanks, equipment blanks, duplicates, and matrix spike/matrix spike duplicates (MS/MSD). After sampling, the locations were professionally surveyed.

Surface Soil Sampling. Twenty-eight surface soil samples were collected from 0 to 6 in. bgs (Figure 2-3). The number, placement, and analysis of samples were based on a review of historical photographs (Figure 2-4), an ecological risk driver comparison from the RI, and potential data gaps identified in the RI.

Prior to sampling, each location was cleared by MEC avoidance personnel, and the grass cover was removed. The After Action Report summarizing the MEC support activities is provided as Appendix A. The surface soil samples were logged by CH2M HILL field scientists (Table 2-2). Surface soil samples were collected with a decontaminated stainless-steel trowel, placed in a decontaminated stainless steel bowl, homogenized, and placed in pre-approved sample containers.

The surface soil samples were submitted to an off-site laboratory for the analysis of the potential human health and ecological risk drivers identified in the RI/HHRA/ERA; Target Compound List (TCL) polycyclic aromatic hydrocarbons (PAHs), TCL pesticides, and Target Analyte List (TAL) metals and cyanide. A subset of the surface soil samples, collected from 4 locations where burning was identified in historical photographs, were also analyzed for dioxins and furans (SJS05-SS44, -SS50, -SS53, and -SS66).

Groundwater Sampling. Groundwater samples were collected from two existing shallow (Columbia Aquifer) monitoring wells (SJS05-MW02S and -MW03S) to verify previous MCL exceedances and one existing deep (Yorktown Aquifer) monitoring well (SJS05-MW01D) to verify the presence of explosives in groundwater at Site 5 (Figure 2-2). Because they had not

been utilized since 1999, the monitoring wells were redeveloped prior to sample collection in order to ensure the hydraulic conductivity was consistent across the aquifer and a representative sample was obtained from each location.

Groundwater levels were measured and recorded from the wells prior to aquifer purging. (Table 2-3). Groundwater at Site 5 generally flows south towards Blows Creek as shown on Figures 2-5 and 2-6. The gradient in the shallow Columbia Aquifer (0.009 ft/ft) is slightly greater than the Yorktown Aquifer (2.105×10^{-4} ft/ft). A detailed description of hydrogeologic characteristics at SJCA and the surrounding area can be obtained from Section 4 of the RI/HHRA/ERA (CH2M HILL, March 2003).

Groundwater quality parameters including dissolved oxygen (DO), oxidation reduction potential (ORP), pH, temperature, conductivity, turbidity, and salinity were measured in the field using an in-line flow cell prior to sampling. The water quality parameters at the time of sample collection are noted on Table 2-4.

All groundwater samples were collected from the center of the well screen using a peristaltic pump following a low-flow sampling protocol. The groundwater samples were submitted to an offsite laboratory and analyzed for explosives (SJS05-MW01D) and TAL total metals/cyanide and dissolved metals (SJS05-MW02S and -MW03S).

Engineering Evaluation/Cost Analysis – March 2006

Based on the results of the RI and Draft ERI, Site 5 was divided into three areas of concern: site-wide surface soil contamination and drainage ditch sediment, waste and impacted soils in a 4.3-acre area, and metals in the shallow groundwater. An Engineering Evaluation/Cost Analysis (EE/CA) was developed to address waste and impacted soil in the Site 5 Waste/Burnt Soil Area (CH2M HILL, March 2006). The following five removal action alternatives were evaluated:

1. No action
2. Cover installation
3. Excavation to visible limits and backfill
4. Excavation to seasonal mean low groundwater level and backfill
5. Excavation to visible limits and restoration/wetland creation

Alternative 5, excavation and restoration/wetland creation, was the recommended alternative because the cost is moderate, it is straight forward to implement, it eliminates the on-site risks to human health and the environment by removing the waste and impacted soil, and it removes the potential source of contamination to the groundwater. Additionally, Alternative 5 provides an environmental benefit by creating additional wetland area and enhancing the quality of the existing wetland. Site remediation goals were developed for the contaminants of concern identified in the HHRA (Section 4 of this report) to ensure that the soil remaining at Site 5 within the Waste/Burnt Soil Area following the removal action is protective of human health. Ecological chemicals of concern (COCs) (Section 5 of this report) were not considered in the development of the site remediation goals because the recommended alternative calls for the placement of 6 inches of clean off-site borrow, which will eliminate the exposure pathway for ecological receptors. The removal action is scheduled for 2007.

Table 2-1
Surface Soil and Groundwater Samples and Analytes Collected During
Site 5 Remedial nvestigation and Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virgina

Sample ID	Media	Sample Date	TCL VOCs	TCL SVOCs	TCL PAHs	TCL Pesticides/ PCBs	TCL Pesticides	TAL Total Metals and Cyanide	TAL Dissolved Metals	Explosives	Dioxin/ Furans
Remedial Investigation Samples											
SJS05-GW1D-001	DGW	07/1997	X	X		X		X	X		
SJS05-GW1D-002	DGW	11/1997	X	X		X		X	X		
SJS05-GW1S-001	SGW	07/1997	X	X		X		X	X		
SJS05-GW1S-002	SGW	11/1997	X	X		X		X	X		
SJS05-GW2D-001	DGW	07/1997	X	X		X		X	X		
SJS05-GW2D-002	DGW	11/1997	X	X		X		X	X		
SJS05-GW2S-001	SGW	07/1997	X	X		X		X	X		
SJS05-GW2S-002	SGW	11/1997	X	X		X		X	X		
SJS05-GW3S-001	SGW	07/1997	X	X		X		X	X		
SJS05-GW3S-002	SGW	11/1997	X	X		X		X	X	X	
SJS05-GW1D-003	DGW	05/1999	X	X		X		X	X	X	
SJS05-GW1S-003	SGW	05/1999	X	X		X		X	X	X	
SJS05-GW2D-003	DGW	05/1999	X	X		X		X	X	X	
SJS05-GW2S-003	SGW	05/1999	X	X		X		X	X	X	
SJS05-GW3S-003	SGW	05/1999	X	X		X		X	X	X	
SJS05-GW4D-001	DGW	05/1999	X	X		X		X	X	X	
SJS05-GW4S-001	SGW	05/1999	X	X		X		X	X	X	
SJS05-GW5S-001	SGW	05/1999	X	X		X		X	X	X	
SJS05-SS01-000	SS	06/1997	X	X		X		X			
SJS05-SS02-000	SS	06/1997	X	X		X		X			
SJS05-SS03-000	SS	06/1997	X	X		X		X			
SJS05-SS04-000	SS	06/1997	X	X		X		X			
SJS05-SS05-000	SS	06/1997	X	X		X		X			
SJS05-SS06-000	SS	06/1997	X	X		X		X		X	
SJS05-SS07-000	SS	06/1997	X	X		X		X		X	
SJS05-SS08-000	SS	06/1997	X	X		X		X			
SJS05-SS09-000	SS	06/1997	X	X		X		X			
SJS05-SS10-000	SS	04/1999	X	X		X		X		X	
SJS05-SS11-000	SS	04/1999	X	X		X		X		X	
SJS05-SS12-000	SS	04/1999	X	X		X		X		X	
SJS05-SS13-000	SS	04/1999	X	X		X		X		X	
SJS05-SS14-000	SS	04/1999	X	X		X		X		X	
SJS05-SS15-000	SS	04/1999	X	X		X		X		X	
SJS05-SS16-000	SS	04/1999	X	X		X		X		X	
SJS05-SS17-000	SS	04/1999	X	X		X		X		X	
SJS05-SS18-000	SS	04/1999	X	X		X		X		X	
SJS05-SS19-000	SS	04/1999	X	X		X		X		X	
SJS05-SS20-000	SS	04/1999	X	X		X		X		X	
SJS05-SS21-000	SS	04/1999	X	X		X		X		X	
SJS05-SS22-000	SS	04/1999	X	X		X		X		X	
SJS05-SS23-000	SS	04/1999	X	X		X		X		X	
SJS05-SS24-000	SS	04/1999	X	X		X		X		X	
SJS05-SS25-000	SS	04/1999	X	X		X		X		X	
SJS05-SS26-000	SS	04/1999	X	X		X		X		X	
SJS05-SS27-000	SS	04/1999	X	X		X		X		X	
SJS05-SS28-000	SS	04/1999	X	X		X		X		X	
SJS05-SS30-000	SS	04/1999	X	X		X		X		X	
SJS05-SS31-000	SS	04/1999	X	X		X		X		X	
SJS05-SS32-000	SS	04/1999	X	X		X		X		X	
SJS05-SS33-000	SS	04/1999	X	X		X		X		X	
SJS05-SS34-000	SS	04/1999	X	X		X		X		X	
SJS05-SS35-000	SS	04/1999	X	X		X		X		X	
SJS05-SS36-000	SS	11/2002		X				X			
SJS05-SS37-000	SS	11/2002		X				X			
SJS05-SS38-000	SS	11/2002		X				X			
SJS05-SS39-000	SS	11/2002		X				X			

Table 2-1
Surface Soil and Groundwater Samples and Analytes Collected During
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Sample ID	Media	Sample Date	TCL VOCs	TCL SVOCs	TCL PAHs	TCL Pesticides/ PCBs	TCL Pesticides	TAL Total Metals and Cyanide	TAL Dissolved Metals	Explosives	Dioxin/ Furans
Expanded Remedial Investigation Samples											
SJS05-MW01D-03D	DGW	12/2004								X	
SJS05-MW03S-03D	SGW	12/2004						X	X		
SJS05-MW02S-03D	SGW	12/2004						X	X		
SJS05-SS40-00-03D	SS	12/2004			X		X	X			
SJS05-SS41-00-03D	SS	12/2004			X		X	X			
SJS05-SS42-00-03D	SS	12/2004			X		X	X			
SJS05-SS43-00-03D	SS	12/2004			X		X	X			
SJS05-SS44-00-03D	SS	12/2004			X		X	X			X
SJS05-SS45-00-03D	SS	12/2004			X		X	X			
SJS05-SS46-00-03D	SS	12/2004			X		X	X			
SJS05-SS47-00-03D	SS	12/2004			X		X	X			
SJS05-SS48-00-03D	SS	12/2004			X		X	X			
SJS05-SS49-00-03D	SS	12/2004			X		X	X			
SJS05-SS50-00-03D	SS	12/2004			X		X	X			X
SJS05-SS51-00-03D	SS	12/2004			X		X	X			
SJS05-SS52-00-03D	SS	12/2004			X		X	X			
SJS05-SS53-00-03D	SS	12/2004			X		X	X			X
SJS05-SS54-00-03D	SS	12/2004			X		X	X			
SJS05-SS55-00-03D	SS	12/2004			X		X	X			
SJS05-SS56-00-03D	SS	12/2004			X		X	X			
SJS05-SS57-00-03D	SS	12/2004			X		X	X			
SJS05-SS58-00-03D	SS	12/2004			X		X	X			
SJS05-SS59-00-03D	SS	12/2004			X		X	X			
SJS05-SS60-00-03D	SS	12/2004			X		X	X			
SJS05-SS61-00-03D	SS	12/2004			X		X	X			
SJS05-SS62-00-03D	SS	12/2004			X		X	X			
SJS05-SS63-00-03D	SS	12/2004			X		X	X			
SJS05-SS64-00-03D	SS	12/2004			X		X	X			
SJS05-SS65-00-03D	SS	12/2004			X		X	X			
SJS05-SS66-00-03D	SS	12/2004			X		X	X			X
SJS05-SS67-00-03D	SS	12/2004			X		X	X			

Notes:
DGW - Deep Groundwater
SGW - Shallow Groundwater
SS - Surface Soil

Table 2-2
Surface Soil Descriptions
Site 5 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

Sample ID	Soil Description
SJS05-SS40-00-03D	Sandy clay silt, dark brown red, gravelly
SJS05-SS41-00-03D	Silty clay, dark tan red brown, very wet
SJS05-SS42-00-03D	Broken gray silty clay, saturated, oil sheen
SJS05-SS43-00-03D	--
SJS05-SS44-00-03D	--
SJS05-SS45-00-03D	--
SJS05-SS46-00-03D	--
SJS05-SS47-00-03D	Friable sandy silt material, dark brown
SJS05-SS48-00-03D	Friable sandy silt; dark brown with some organics
SJS05-SS49-00-03D	Dark brown clay sand, moist
SJS05-SS50-00-03D	--
SJS05-SS51-00-03D	Dark gray, gravelly sand, fill material
SJS05-SS52-00-03D	Dark brown sandy clay, some shells, ABM present
SJS05-SS53-00-03D	--
SJS05-SS54-00-03D	Dark brown sandy silt, large shell fragments
SJS05-SS55-00-03D	Dark brown silty sand
SJS05-SS56-00-03D	Sandy clay, loose, dry, gray brown
SJS05-SS57-00-03D	Grey brown silty clay, loose, moist
SJS05-SS58-00-03D	Silty clay, slightly moist, gray brown, some organics
SJS05-SS59-00-03D	Silty clay, dark brown with organics, dry
SJS05-SS60-00-03D	Brown silty clay, moist, some organics
SJS05-SS61-00-03D	Medium brown sandy clay, earthworms present
SJS05-SS62-00-03D	Gravelly silty clay, brown tan
SJS05-SS63-00-03D	Sandy clay, brown gray, moist
SJS05-SS64-00-03D	Silty sand, dark gray brown, moist, some gravel present
SJS05-SS65-00-03D	Sandy silt with lots of gravel, fill material, bricks
SJS05-SS66-00-03D	--
SJS05-SS67-00-03D	Sandy clay, tan brown, some oxidation present

Note:
-- soil description not available

Table 2-3
Water Level Survey
Site 5 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

Monitoring Well ID	Depth to Water (ft-btoc)	Top of Casing Elevation (ft-msl)	Groundwater Elevation (ft-msl)
SJS05-MW01S	2.92	9.76	6.84
SJS05-MW02S	3.47	7.89	4.42
SJS05-MW03S	3.34	9.32	5.98
SJS05-MW04S	2.87	11.09	8.22
SJS05-MW05S	3.29	9.99	6.70
SJS05-MW01D	6.40	9.23	2.83
SJS05-MW02D	5.10	7.76	2.66
SJS05-MW04D	8.09	10.84	2.75

Note:
Water level measurements were collected on December 15, 2003 prior to groundwater sampling activities.
btoc = below top of casing
ft = feet
msl = mean sea level

Table 2-4
Groundwater Field Parameters
Site 5 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS05-MW01D	SJS05-MW02S	SJS05-MW03S
Sample ID	SJS05-MW01D-03D	SJS05-MW02S-03D	SJS05-MW03S-03D
Sample Date	12/15/2003	12/15/2003	12/15/2003
Field Parameters			
Dissolved Oxygen (MG/L)	0.4	0.6	0.36
Oxidation Reduction Potential (mV)	-181	260	210
pH (pH)	7.44	3.66	3.76
Salinity (%)	0	0.1	0.01
Specific Conductance (ms/cm)	0.596	2.35	1.5
Temperature (C)	16.3	15.1	14.7
Turbidity (NTU)	241	35.5	209

v:\18gis\st-juliens\figures\site5_eeca.apr 6/12/06 munwin

LEGEND

- Shallow Monitoring Well Location
- Deep Monitoring Well Location
- Site 5 Waste/Burnt Soil Area
- Site 5 Boundary
- Lower Drainage
- Upland Drainage
- Existing Wetland Area
- Existing Building
- Former Building

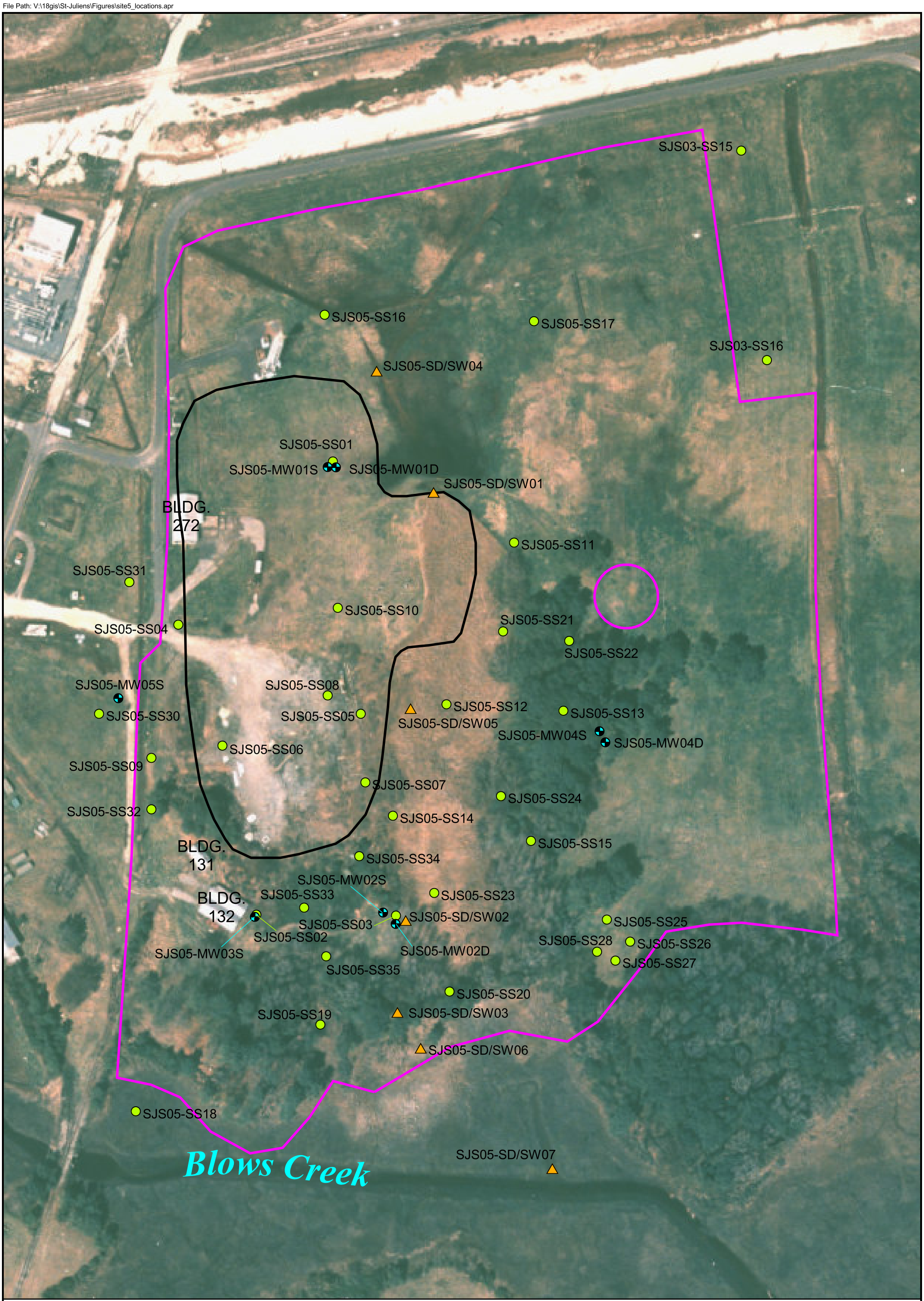
N

0 125 250 Feet

Figure 2-1
Site 5 Boundary and Features
Site 5 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

File Path: V:\18gis\St-Juliens\Figures\site5_locations.apr



LEGEND

- Surface Soil Sampling Locations
- Sediment/Surface Water Sampling Locations
- Monitoring Well Locations
- Site 5 Waste/Burnt Soil Area
- Site 5 Boundary

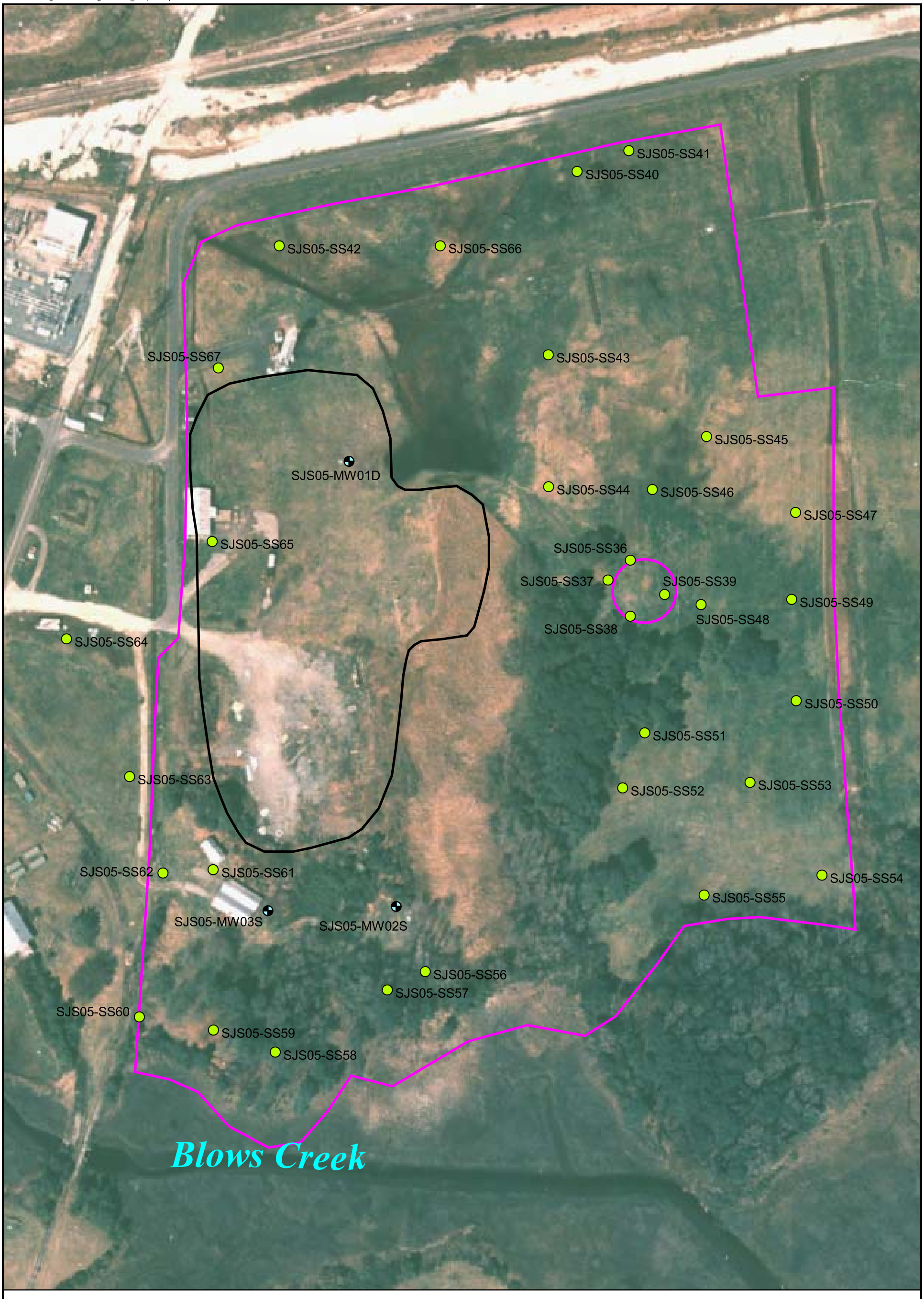
N

0 125 250 Feet

Figure 2-2
Site 5 Remedial Investigation Sampling Locations
Site 5 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

File Path: V:\18gis\St-Juliens\Figures\site5_samplocs.apr



Groundwater Sampling Locations
Surface Soil Sampling Locations
Site 5 Waste/Burnt Soil Area
Site 5 Boundary

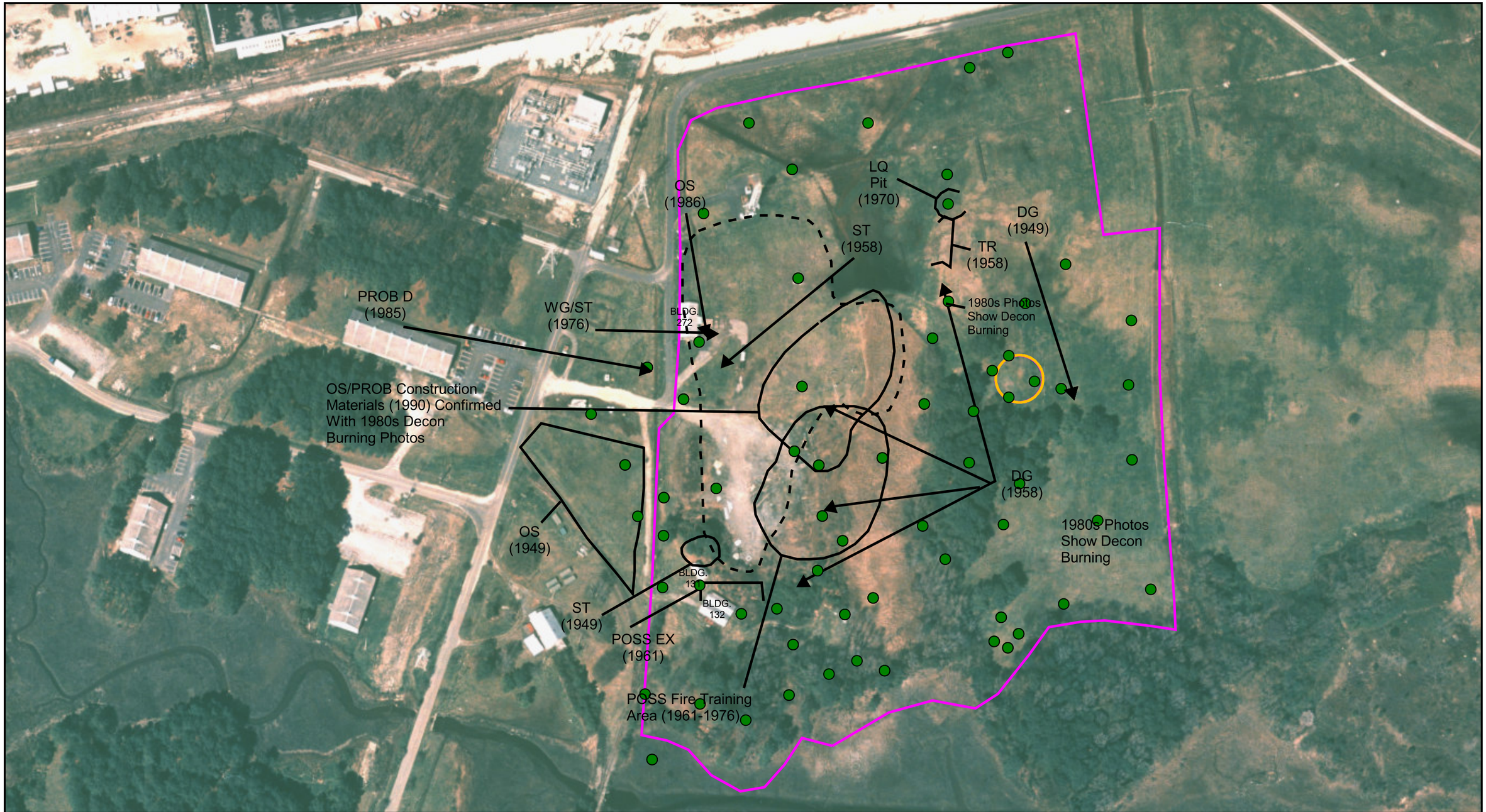
N

0 125 250 Feet

Figure 2-3
Site 5 Expanded Remedial Investigation Sampling Locations
Site 5 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

File Path: v:\18gis\st-juliens\figures\sites3-6_ri.apr



LEGEND

- Surface Soil Sample Locations
- Former Site 6 Boundary
- Site 5 Waste/Burnt Soil Area
- Site 5 Boundary

D - Drums
DG - Disturbed Ground
EX - Excavation
LQ - Liquid
OS - Open Storage Area
ST - Stain
TR - Trench
WG - Wet Ground

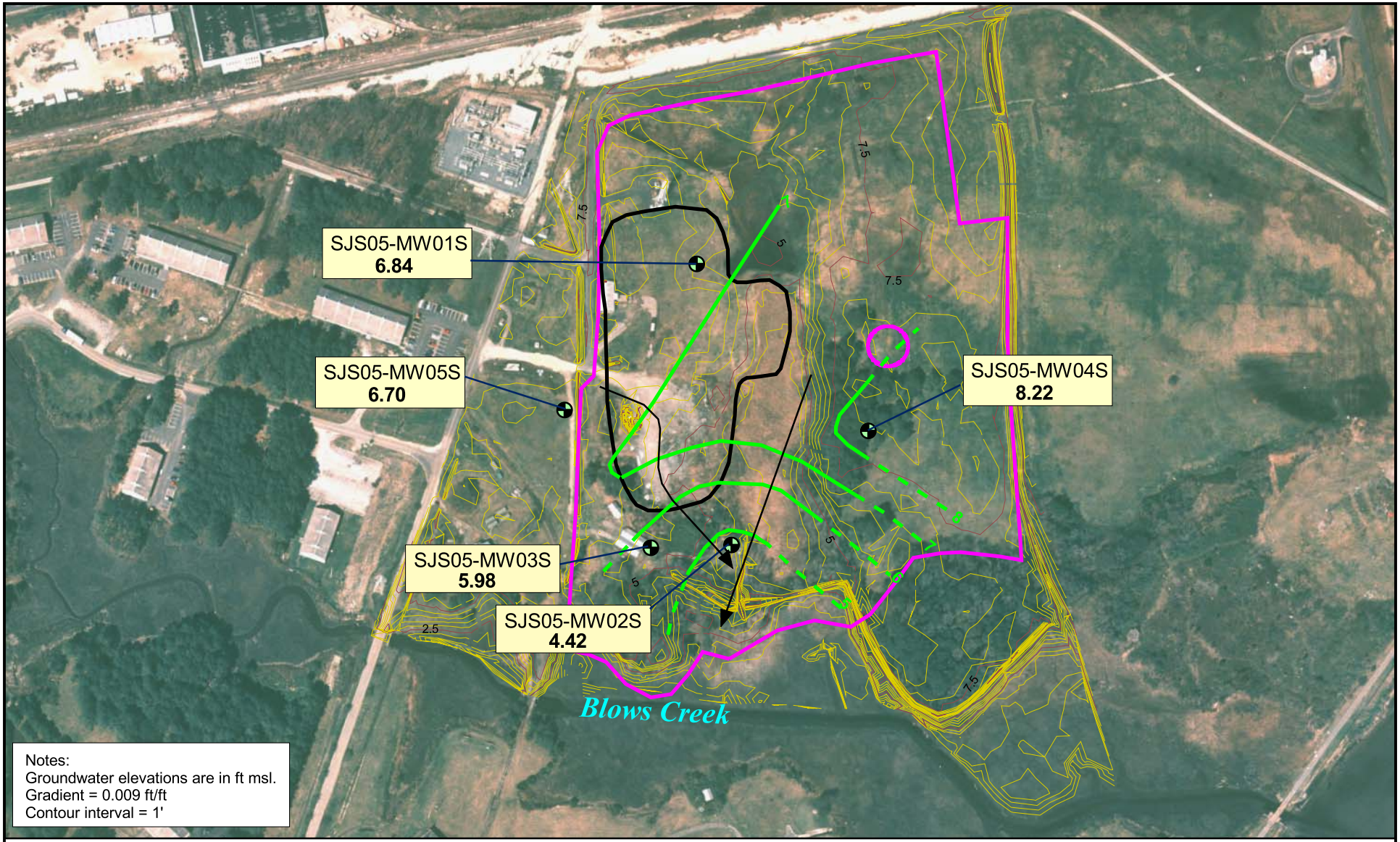
N

0 200 400 Feet

Figure 2-4
Site 5 Historical Photo Review
Site 5 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

File Path: v:\18gis\st-juliens\figures\site5_samplocs.apr



LEGEND

- Shallow Monitoring Well Locations
- Site 5 Waste/Burnt Soil Area
- Site 5 Boundary
- Elevation Contours (0.5 ft interval)
- Contours of Columbia Aquifer Potentiometric Surface (December 2003) Contours are dashed where inferred.
- Groundwater Flow Direction

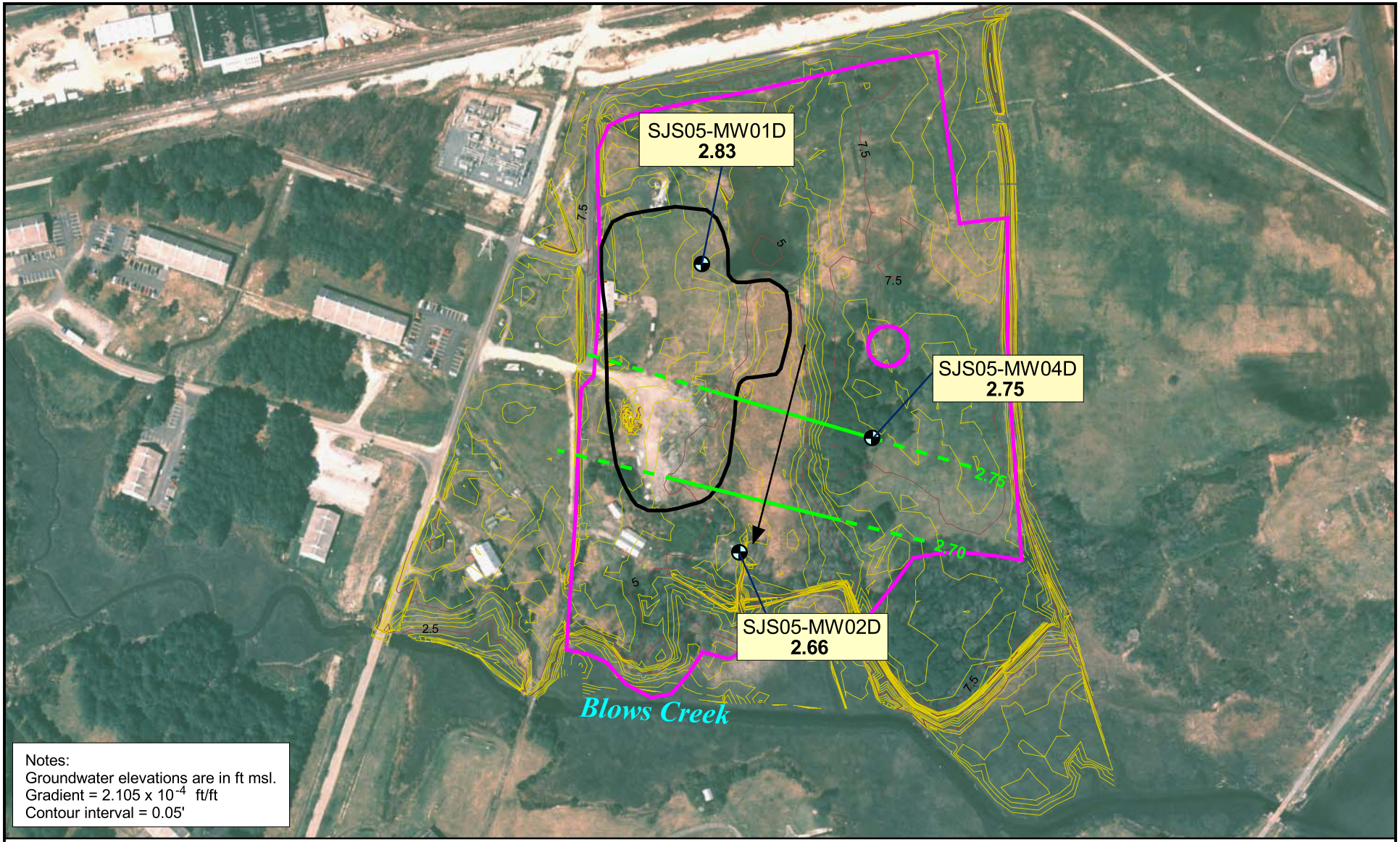
N

0 150 300 Feet

Figure 2-5
Shallow Groundwater Potentiometric Surface Map
Site 5 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

File Path: v:\18gis\st-juliens\figures\site5_samplocs.apr



Notes:
Groundwater elevations are in ft msl.
Gradient = 2.105 x 10^{-4} ft/ft
Contour interval = 0.05'

LEGEND

- Deep Monitoring Well Locations
- Site 5 Waste/Burnt Soil Area
- Site 5 Boundary
- Elevation Contours (0.5 ft interval)
- Contours of Yorktown Aquifer Potentiometric Surface (December 2003) Contour lines are dashed where inferred
- Groundwater Flow Direction

N

0 150 300 Feet

Figure 2-6
Yorktown Aquifer Potentiometric Surface Map
Site 5 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

SECTION 3

Expanded Nature and Extent of Contamination

This section provides information on the management and evaluation of analytical data collected during the ERI and a summary of the nature and extent of contamination and fate and transport of contamination.

3.1 Data Management and Evaluation

3.1.1 Data Management

Data management and tracking, from the time of field collection to receipt of validated electronic analytical results, is of primary importance and reflects the overall quality of the analytical results. Field samples and their corresponding analytical tests were recorded on executed chain-of-custody forms, which were submitted with the samples to the laboratory. Chain-of-custody entries were checked against the site-specific project instructions and ERI Work Plan (CH2M HILL, December 2003) to verify that all designated field samples were collected and submitted for the appropriate analysis. Upon receipt of the samples by the laboratory (Mitkem), a comparison to the field information was made to verify that each sample was analyzed for the correct parameters. In addition, a check was made to ensure that the proper numbers and types of QA/QC samples were collected.

Data Validation

Analytical data reports, in hardcopy and electronic format, for the RI samples were submitted to a Navy-approved third party validator (Environmental Data Quality). The data validation report is provided as Appendix B. Procedures used for validation were *Region III Modifications to the National Functional Guidelines for Organic Data Review, Multi-media, Multi-concentration* (EPA, 1994), and *Region III Modifications to Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analysis* (EPA, 1993). The electronic data were downloaded into the CH2M HILL master Oracle database.

The data validation qualifiers, or flags, used for the Site 5 surface soil and groundwater data and a brief interpretation are presented herein:

- Data qualified with a "B" flag by the data validator indicate that the analytes have also been detected in a field, equipment, or trip blank or in a laboratory QA/QC sample. The concentration of a "B"-qualified result is less than 10 times the concentration of the constituent for an associated QA/QC result. If the sample concentration is less than 10 times the associated blank concentration, the conclusion is that the parameter was not detected. Subsection 3.1.2.1 provides further discussion of potential sources of blank contamination.
- Data qualified with a "J" flag indicate that the values were estimated.
- Data qualified with a "K" indicate that the analyte is present. The reported value may be biased high and the actual value is expected to be lower.

- Data qualified with an "L" indicate that the analyte is present. The reported value may be biased low and the actual value is expected to be higher.
- Data qualified with a "Q" indicate estimated possible maximum concentration of dioxin/furan.
- Data qualified with an "R" indicate an unusable result. The analyte may or may not be present and the result was rejected. All rejected data were excluded from the RI and risk assessments.
- Data qualified with a "U" indicate that the analyte was not detected and the associated number indicates the approximate sample concentration necessary to be detected.
- Data qualified with a "UJ" indicate that the analyte was not detected and the quantitation limit may be inaccurate or imprecise.
- Data qualified with a "UL" indicate that the analyte was not detected and the quantitation limit is probably higher.

3.1.2 Data Evaluation

Non-Site Related Analytical Results

Some of the organic (i.e., PAHs and pesticides) and inorganic constituents (i.e., metals) detected in surface soil and/or groundwater from Site 5 may be attributed to non-site-related conditions or sources such as laboratory contaminants, anthropogenic non-site release sources, and naturally occurring (background) concentrations of constituents.

Additionally, the inorganic constituents calcium, magnesium, potassium, and sodium are not typical in waste streams characteristic of the activities conducted at SJCA. These common metals are not considered potential site-related compounds and therefore do not warrant detailed attention or discussion. Additionally, with the exception of magnesium, there are no human health or ecological screening criteria for these common metals.

Laboratory and Sample Blank Contamination

In some instances, chemical compounds detected in samples may have been introduced during field sampling, transportation to the analytical laboratory, or during laboratory procedures. A variety of blank samples were analyzed and used in the QA process to determine which of the contaminants may or may not be attributed to the field sample. A field blank is collected to account for ambient conditions during sample collection. An equipment or rinseate blank is collected to determine if the equipment used to collect the samples (e.g. augers, bailers, and sample containers) was adequately clean. Additionally, the laboratory analyzes a method blank in each batch of 20 samples to verify instrument cleanliness and function. Common phthalate compounds can be introduced during the analytical process and are often considered laboratory contaminants.

When blank samples are found to contain common laboratory contaminants, each of the aqueous field samples associated with that blank that contain up to 10 times the concentrations in the blanks are qualified during data validation with a "B" for that compound. A "B" qualifier means that the compound may not be attributed to the site at

that sample location. When a sampling or laboratory blank contains contaminants other than the common laboratory contaminants, each of the aqueous field samples associated with that blank that contain up to 5 times the concentrations is qualified during data validation with a "B" for that compound.

To determine if a "B" qualifier should be assigned to a soil sample, a unit conversion is performed whereby soil sample concentrations relative to aqueous samples or laboratory blank concentrations are determined by dividing the soil concentration by the percentage of moisture, then dividing the result by five. A "B" qualifier designation, as described above for aqueous samples, can then be applied directly to the converted soil concentrations.

Background Data

To identify constituents present in site media reflective of a potential site-related release, naturally occurring and anthropogenic compounds (metals, pesticides, and PAH semivolatile organic compounds [SVOCs]) detected were compared to available SJCA surface soil and shallow groundwater background 95% upper tolerance levels (UTLs).

Based on mapping from the 1983 U.S. Department of Agriculture (USDA), the Site 5 area is located in the Dredge Fill and Munden-Tetotum (east of Cradock Street only) soil types (CH2M HILL, October 2001). The Munden-Tetotum soils are defined as moderately well-drained soils that have a subsoil of sandy loam or clayey loam. Dredge fill consists of poorly sorted silt and clay with thin lenses of fine sand. Based on uncertainty in mapping and dredge filling suspected over the entire site area, the SJCA Project Management Team (representatives from the Navy, EPA, and VDEQ) agreed to classify soils east of Cradock Street as Dredge Fill soils.

A central-tendency (CT) population-to-population comparison between background Dredge Fill surface soil (10 samples) and Site 5 surface soil (66 samples) was conducted to determine if the two populations were statistically similar or if the site is statistically elevated over background. The site/background data sets had nonparametric distributions; therefore, CT statistical analyses of the populations were conducted using the Wilcoxon Rank Sum method. The statistical comparison plots for surface soil are provided in Appendix C.

Dioxins and Furans

Dioxins and furans data for surface soil were evaluated in accordance with EPA guidance ("Approach for Addressing Dioxin in Soil at CERCLA and RCRA Sites," OSWER Directive 9200.4-26, signed April 13, 1998). This EPA evaluation method compares the total toxicity equivalent (TEQ) for all the dioxins and furans in a sample to the toxicity equivalency factor (TEF) adjusted risk-based concentration (RBC). If the location's TEQ exceeds TEF-adjusted RBC then dioxins and furans are considered to exceed screening levels.

TEFs are assigned using an EPA procedure that assigns individual TEFs to the polychlorinated dibenzodioxins (CDDs) which include 75 individual compounds, and the polychlorinated dibenzofurans (CDFs) which include 135 individual compounds. These individual compounds are technically referred to as congeners. The TEF values have had international endorsement (EPA, 1989; Ahlborg et al., 1994) and range from zero for compounds with no known dioxin-like toxicity to 1.0 for compounds such as 2,3,7,8-TCDD

that have full dioxin-like toxicity. The TEQ of dioxins and furans in a sample is the sum of the constituent concentration times the TEF.

3.2 Expanded Nature and Extent of Contamination

This subsection presents the analytical results of surface soil and groundwater samples collected during ERI and a brief comparison to the analytical results from the RI. A complete summary of the analytical data collected during the December 2003 ERI is provided as Appendix D.

3.2.1 Surface Soil

Detected constituents are presented in Table 3-1. Shaded cells indicate that the parameter exceeded the 95-percent background UTL for Dredge Fill surface soil. Site/background population-to-population CT statistical analysis results are provided in Appendix C. Table 3-2 contains the dioxins and furans TEQ comparison to TEFs. Figure 3-1 illustrates the distribution of potential site-related contaminants in surface soil at Site 5.

PAHS. Fifteen PAHs were detected in surface soil at Site 5 during the ERI. Only acenaphthylene and benzo(g,h,i)perylene exceeded background UTLs. Acenaphthylene concentrations were above the background UTL of 246 µg/kg at sampling locations SJS05-SS41 (540 µg/kg) and SJS05-SS57 (380 J µg/kg). Benzo(g,h,i)perylene was detected above the background UTL of 1,655 µg/kg at SJS05-SS66 (2,300 µg/kg).

Acenaphthylene concentrations at Site 5 also indicated a statistical difference from background based on the population-to-population comparison. However, this is largely due to the frequency of non-detected results above background UTLs. Therefore, it is unlikely that the presence of PAHs in surface soil are a result of site-related activities.

During the RI, no SVOCs were detected above background UTLs.

Pesticides. Five pesticides were detected in Site 5 surface soil during the ERI. 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT exceeded background UTLs in the majority of samples and the results were also statistically different than background concentrations. Endrin ketone and endosulfan sulfate, which were not detected in background, but were detected at low levels in isolated areas at Site 5.

During the RI, pesticide concentrations were similar across the site.

Although pesticides were reportedly disposed of at the Site 5 burning grounds (NEESA, August 1981). Reports also indicate that spray tanks of pesticides were generally used every day as part of basewide application at SJCA from the 1950s through 1960s (NEESA, August 1981). The highest concentrations of pesticides at Site 5 were found in samples collected in generally undisturbed areas and their presence in surface soil is likely to represent historic application at the facility.

Metals. Of the 24 metals detected in surface soil during the ERI at Site 5, nineteen analytes exceeded background UTLs at least once. Only one sample location (SJS05-SS55), located to the southeast, did not contain metals above the background UTLs. Cadmium, cyanide, and thallium were detected in Site 5 surface soil but were not detected in background.

Only antimony, barium, beryllium, and cadmium; in Site 5 surface soil were detected at concentrations statistically different than background samples based on the population-to-population comparison. However, because the nonparametric statistical test conducted assumes that the data sets are the same shape (i.e., similar distribution), a few metals detected at the site which indicate no statistical difference from background violate the assumptions based on the discrepancy in sample sizes (66 site and 10 background). Individual concentrations of arsenic, copper, lead, nickel, silver, and zinc across Site 5 significantly exceeded the individual background UTLs in several samples and therefore, should be considered as different from background.

The most elevated metals concentrations were generally to the east and north with the highest concentrations occurring at SJS05-SS44 and SJS05-SS66. However, there is no pattern or trend of exceedances.

During the RI, metal concentrations were similar across the site.

Dioxins and Furans. The cumulative TEQ for dioxins and furans exceeded the TEF-adjusted RBC (0.0043 μg/kg) at all four locations where dioxins and furans were collected, SJS05-SS44, -SS50, -SS53, and -SS66. Surface soil samples were not analyzed for dioxins and furans during the RI.

3.2.2 Groundwater

Detected constituents are presented in Table 3-3. Outlined cells indicate that the parameter exceeded the MCL and shaded cells indicate that the parameter exceeded the 95-percent background UTL for groundwater. Figure 3-2 illustrates the distribution of MCL exceedances in shallow groundwater collected during the ERI at Site 5.

Explosives. There were no detections of explosives in deep groundwater sample SJS05-MW01D collected during the ERI. Because this monitoring well is located within the waste, the detection of RDX during the RI likely originated from the soil during monitoring well installation.

Metals. Groundwater samples collected during the RI revealed exceedances of the MCLs for beryllium, cadmium, and lead at SJS05-MW03S and beryllium at SJS05-MW02S. During the ERI, beryllium was the only metal detected above the MCL (4 μg/l) and background UTL (1.4 μg/l) at SJS05-MW02S (5.5 μg/l) and SJS05-MW03S (7.6 μg/l). Dissolved beryllium concentrations were similar, 5.8 μg/l at SJS05-MW02S and 7.5 μg/l at SJS05-MW03S.

Since the sample collection in November 1997 during the RI, it appears that beryllium concentrations have decreased:

Date	SJS05-MW02S	SJS05-MW03S
July 1997	1 U μg/l	1.2 J μg/l
November 1997	18.3 μg/l	13.5 μg/l
May 1999	4.5 J μg/l	9.1 μg/l
December 2003	5.5 μg/l	7.6 μg/l

3.3 Contaminant Fate and Transport Summary

An extensive discussion of contaminant fate and transport is provided in the RI/HHRA/ERA for Site 5 (CH2M HILL, March 2003a). Fate and transport conclusions for samples collected during the ERI are consistent with those identified in the RI as follows:

- Dissolution of metals in soil by surface water runoff and erosion and transport to surface water and sediment;
- Suspension of metals, PAHs, pesticides, and explosives adsorbed to soil in surface water runoff across the site and transport to surface water in drainage swales and deposition to sediment;
- Potential for leaching of metals in soils and sediments and infiltration through the vadose zone to shallow groundwater;
- Discharge of metals in groundwater to surface water; and
- Transport of dissolved metals from the Columbia Aquifer to the Upper Yorktown Aquifer.

Table 3-1
Surface Soil Detections and Exceedances of Background UTLs
Site 5 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	Frequency of Detection	Max Value	Max Location	95% Background UTL	SJS05-SO40	SJS05-SO41	SJS05-SO42	SJS05-SO43	SJS05-SO44	SJS05-SO45	SJS05-SO46	SJS05-SO47	SJS05-SO48	SJS05-SO49	SJS05-SO50	SJS05-SO51	SJS05-SO52
Sample ID					SJS05-SS40-00-03D	SJS05-SS41-00-03D	SJS05-SS42-00-03D[1]	SJS05-SS43-00-03D	SJS05-SS44-00-03D	SJS05-SS45-00-03D	SJS05-SS46-00-03D	SJS05-SS47-00-03D	SJS05-SS48-00-03D[1]	SJS05-SS49-00-03D	SJS05-SS50-00-03D[1]	SJS05-SS51-00-03D	SJS05-SS52-00-03D
Sample Date					12/11/03	12/11/03	12/11/03	12/10/03	12/10/03	12/10/03	12/10/03	12/10/03	12/10/03	12/10/03	12/10/03	12/10/03	12/10/03
Chemical Name																	
Semi-volatile Organic Compounds (UG/KG)																	
2,4-Dinitrotoluene	1 - 4	68	SJS05-SS36-000	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	1 - 32	57	SJS05-SS45-00-03D	--	480 U	500 U	500 U	480 U	440 U	57 J	840 U	430 U	400 U	480 U	500 U	370 U	410 U
4-Nitroaniline	1 - 4	460	SJS05-SS37-000	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	13 - 32	540	SJS05-SS41-00-03D	246	480 U	540	52 J	480 U	440 U	150 J	120 J	71 J	400 U	130 J	150 J	370 U	410 U
Anthracene	11 - 32	450	SJS05-SS41-00-03D	462	480 U	450 J	500 U	480 U	440 U	140 J	840 U	90 J	400 U	130 J	120 J	370 U	410 U
Benzo(a)anthracene	25 - 32	1,500	SJS05-SS41-00-03D	2,027	480 U	1,500	96 J	70 J	440 U	500	340 J	370 J	42 J	420 J	410 J	120 J	410 U
Benzo(a)pyrene	25 - 32	910	SJS05-SS41-00-03D	1,785	480 U	910	120 J	60 J	440 U	530	370 J	340 J	400 U	470 J	410 J	130 J	44 J
Benzo(b)fluoranthene	27 - 32	2,700	SJS05-SS41-00-03D	3,197	480 U	2,700	200 J	120 J	440 U	900	750 J	560	55 J	860	840	190 J	67 J
Benzo(g,h,i)perylene	19 - 32	2,300	SJS05-SS66-00-03D	1,655	480 U	110 J	500 U	59 J	440 U	430 J	350 J	240 J	400 U	390 J	380 J	93 J	410 U
Benzo(k)fluoranthene	24 - 32	820	SJS05-SS41-00-03D	2,038	480 U	820	58 J	55 J	440 U	420 J	250 J	220 J	400 U	340 J	330 J	66 J	27 J
Carbazole	1 - 4	14	SJS05-SS37-000	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	22 - 32	2,200	SJS05-SS41-00-03D	3,487	480 U	2,200	130 J	80 J	440 U	740	500 J	430	39 J	690	610	140 J	410 U
Di-n-butylphthalate	3 - 4	37	SJS05-SS38-000	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	11 - 32	560	SJS05-SS66-00-03D	714	480 U	450 J	500 U	480 U	440 U	150 J	120 J	82 J	400 U	140 J	140 J	370 U	410 U
Fluoranthene	26 - 32	1,600	SJS05-SS41-00-03D	2,766	480 U	1,600	75 J	74 J	440 U	600	470 J	430	49 J	540	610	220 J	410 U
Indeno(1,2,3-cd)pyrene	23 - 32	1,600	SJS05-SS66-00-03D	1,829	480 U	840	96 J	55 J	440 U	410 J	320 J	240 J	400 U	370 J	380 J	77 J	410 U
Naphthalene	4 - 32	77	SJS05-SS45-00-03D	485	480 U	500 U	500 U	480 U	440 U	77 J	840 U	52 J	400 U	67 J	500 U	370 U	410 U
Phenanthrene	20 - 32	390	SJS05-SS41-00-03D	913	480 U	390 J	500 U	480 U	440 U	230 J	170 J	220 J	400 U	210 J	250 J	110 J	410 U
Pyrene	27 - 32	1,100	SJS05-SS41-00-03D	2,590	63 J	1,100	85 J	65 J	440 U	430 J	360 J	330 J	49 J	400 J	440 J	180 J	410 U
Pesticide/Polychlorinated Biphenyls (UG/KG)																	
4,4'-DDD	21 - 28	33	SJS05-SS66-00-03D	5.3	7.3	4.3 J	5 U	6.8	4.9 J	11	23	25	4.1 U	9.7	23	18	14.1
4,4'-DDE	28 - 28	1,300	SJS05-SS59-00-03D	9	19	8.9 J	18	4.9	370	190	59	820	30	270	370	160	51.1
4,4'-DDT	28 - 28	1,400	SJS05-SS56-00-03D	21	10	10 J	11	36	170	26	24	130 J	6.7	180	160	16	39.2
Endosulfan sulfate	4 - 28	11	SJS05-SS53-00-03D	--	4.7 U	4.9 U	5 U	4.8 U	4.4 U	4.4 U	8.2 U	8.4 U	4.1 U	5.4 J	6.2 J	3.7 U	4 U
Endrin ketone	3 - 28	20	SJS05-SS53-00-03D	--	4.7 U	4.9 U	5 U	4.8 U	4.4 U	4.4 U	8.2 U	8.4 U	4.1 U	5.6 J	11	3.7 U	4 U
Total Metals (MG/KG)																	
Aluminum	32 - 32	22,200	SJS05-SS49-00-03D	22,786	900	7,710	8,410	7,170	2,700	9,780	17,900	7,640	9,870	22,200	19,400	2,230	5,600
Antimony	10 - 16	56.5	SJS05-SS44-00-03D	1.47	0.53 L	0.56 UL	0.57 UL	0.55 R	56.5 L	0.67 L	44.7 L	0.47 R	1.7 L	0.52 R	0.58 R	0.42 R	0.46 R
Arsenic	32 - 32	136	SJS05-SS46-00-03D	24	1.7 J	7	9.5	24.1	40	7.4	136	10.6	10.4	18	11	0.88 J	2.2 J
Barium	32 - 32	23,900	SJS05-SS36-000	98	96.2	37.4 J	46.6 J	171	1,380	282	16,500	104	717	112	121	33.9 J	3,350
Beryllium	32 - 32	1	SJS05-SS52-00-03D	1	0.086 J	0.15 J	0.45 J	0.2 J	0.092 J	0.21 J	0.14 J	0.22 J	0.36 J	0.39 J	0.48 J	0.086 J	1 J
Cadmium	17 - 32	47.8	SJS05-SS38-000	--	0.053 U	0.056 U	0.057 U	0.73 J	11.1	0.046 U	9.2	0.047 U	4.1	0.052 U	0.048 U	0.16 J	3.2
Calcium	32 - 32	165,000	SJS05-SS51-00-03D	3,251	331 J	419 J	1,100 J	3,550 J	5,660 J	1,490 J	3,810 J	540 J	9,170 J	3,390 J	2,350 J	165,000 J	2,110 J
Chromium	32 - 32	81.3	SJS05-SS36-000	45	15.1	15.5	13.8	15	45.4	19.7	51	17.4	27.3	41	35.3	2.6	28
Cobalt	31 - 32	15.7	SJS05-SS66-00-03D	13	1.3 J	1.3 J	10.2 J	5.1 J	5.6 J	2.7 J	0.78 J	2.1 J	4 J	5.3 J	4.7 J	1.2 J	7.7 J
Copper	32 - 32	209,000	SJS05-SS44-00-03D	58	14.8 J	22 J	14.8 J	63.3 J	209,000 J	30.7 J	555 J	32.4 J	92.4 J	60.3 J	148 J	8.6 J	138 J
Cyanide	11 - 32	5.2	SJS05-SS51-00-03D	--	0.18 U	0.21 U	0.19 U	3 U	0.58 J	0.18 U	0.33 U	0.18 U	0.21 J	0.25 J	0.21 J	5.2	0.54 J
Iron	32 - 32	66,800	SJS05-SS38-000	45,805	9,340	16,200	25,800	16,500	45,300	17,700	26,800	18,600	15,000	40,300	31,300	3,690	12,000
Lead	32 - 32	2,950	SJS05-SS66-00-03D	147	832	36.2	36.9	67.1	683	98.4	1,000	520	259	557	157	17.5	502
Magnesium	32 - 32	9,820	SJS05-SS36-000	4,507	237 J	1,340 J	2,120	1,610	5,970	1,870	2,600	1,550	1,810	4,430	3,600	965 J	1,380
Manganese	32 - 32	1,870	SJS05-SS36-000	198	49.7 K	37.9 K	558 K	132	723	64.7	297	72.7	255	145	121	265	105
Mercury	25 - 32	0.69	SJS05-SS49-00-03D	1.3	0.062 U	0.23	0.14 J	0.37	0.082 J	0.33	0.44	0.22	0.09 J	0.69	0.52	0.064 J	0.062 U
Nickel	32 - 32	198	SJS05-SS44-00-03D	19	3.1 J	3.9 J	14	14.5	198	7.2 J	18 J	6.1 J	8.7 J	14.2	13.7	1.9 J	71.1
Potassium	26 - 32	3,690	SJS05-SS56-00-03D	4,577	195 B	1,600	2,160	1,080 J	269 B	1,350	2,070 J	1,460	1,160 J	3,180	2,620	413 J	521 J
Selenium	3 - 32	6.1	SJS05-SS44-00-03D	2.2	0.79 U	0.84 U	0.85 U	0.83 UL	6.1 L	0.69 UL	1.4 UL	0.7 UL	0.72 UL	0.77 UL	0.72 UL	0.63 UL	0.69 UL
Silver	29 - 32	23.4	SJS05-SS66-00-03D	0.67	1.3 J	2.3 J	3.5	2.5 J	19.8	2.7	4.4 J	2.9	2.4	6.1	4.3	1 J	2 J
Sodium	14 - 32	1,710	SJS05-SS42-00-03D	620	55.7 B	320 J	1,710	548 J	51.7 B	95.4 B	133 B	97.7 B	111 B	262 J	137 B	841 J	173 B
Thallium	11 - 32	7.7	SJS05-SS44-00-03D	--	0.53 U	0.6 J	0.57 U	0.55 U	7.7	0.46 U	0.92 U	0.47 U	0.52 J	0.52 U	0.48 U	1.5 J	0.52 J
Vanadium	32 - 32	67.2	SJS05-SS46-00-03D	70	5 J	21.2	26.4	23.7	6.5 J	26	67.2	26.1	19.7	55.9	53.9	8.3 J	35.2
Zinc	32 - 32	124,000	SJS05-SS44-00-03D	137	114 J	30.2 J	93.7 J	2,100	124,000	70.7	2,160	61.2	469	121	114	44.6	1,870

Notes:

Exceeds Background UTL

-- no criteria available

NA - not analyzed

B - analyte not detected above associated blank

J - estimated value

K - analyte present; value may be biased low

L - analyte present; value may be biased high

R - unreliable result

U - analyte not detected

[1] A duplicate sample was collected for this sample and the results provided are the maximum concentration between the sample and the duplicate.

Table 3-1
Surface Soil Detections and Exceedances of Background UTLs
Site 5 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	Frequency of Detection	Max Value	Max Location	95% Background UTL	SJS05-SO53	SJS05-SO54	SJS05-SO55	SJS05-SO56	SJS05-SO57	SJS05-SO58	SJS05-SO59	SJS05-SO60	SJS05-SO61	SJS05-SO62	SJS05-SO63	SJS05-SO64	SJS05-SO65
Sample ID					SJS05-SS53-00-03D	SJS05-SS54-00-03D	SJS05-SS55-00-03D	SJS05-SS56-00-03D	SJS05-SS57-00-03D	SJS05-SS58-00-03D	SJS05-SS59-00-03D	SJS05-SS60-00-03D	SJS05-SS61-00-03D	SJS05-SS62-00-03D	SJS05-SS63-00-03D	SJS05-SS64-00-03D	SJS05-SS65-00-03D
Sample Date					12/10/03	12/10/03	12/10/03	12/11/03	12/11/03	12/11/03	12/11/03	12/11/03	12/11/03	12/10/03	12/10/03	12/10/03	12/10/03
Chemical Name																	
Semi-volatile Organic Compounds (UG/KG)																	
2,4-Dinitrotoluene	1 - 4	68	SJS05-SS36-000	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	1 - 32	57	SJS05-SS45-00-03D	--	410 U	400 U	410 U	510 U	480 U	450 U	570 U	500 U	440 U	370 U	420 U	380 U	400 U
4-Nitroaniline	1 - 4	460	SJS05-SS37-000	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	13 - 32	540	SJS05-SS41-00-03D	246	49 J	400 U	410 U	150 J	380 J	450 U	570 U	500 U	440 U	370 U	420 U	380 U	400 U
Anthracene	11 - 32	450	SJS05-SS41-00-03D	462	180 J	400 U	410 U	150 J	290 J	450 U	570 U	500 U	440 U	370 U	420 U	380 U	400 U
Benzo(a)anthracene	25 - 32	1,500	SJS05-SS41-00-03D	2,027	810	290 J	100 J	230 J	1,100	450 U	72 J	500 U	440 U	370 U	130 J	98 J	140 J
Benzo(a)pyrene	25 - 32	910	SJS05-SS41-00-03D	1,785	840	290 J	110 J	130 J	560	53 J	570 U	500 U	440 U	370 U	130 J	97 J	130 J
Benzo(b)fluoranthene	27 - 32	2,700	SJS05-SS41-00-03D	3,197	1,600	400 J	160 J	560	1,900	450 U	93 J	500 U	73 J	370 U	240 J	170 J	200 J
Benzo(g,h,i)perylene	19 - 32	2,300	SJS05-SS66-00-03D	1,655	330 J	210 J	80 J	510 U	70 J	450 U	570 U	500 U	440 U	370 U	110 J	79 J	110 J
Benzo(k)fluoranthene	24 - 32	820	SJS05-SS41-00-03D	2,038	660	150 J	63 J	170 J	560	450 U	570 U	500 U	440 U	370 U	84 J	55 J	80 J
Carbazole	1 - 4	14	SJS05-SS37-000	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	22 - 32	2,200	SJS05-SS41-00-03D	3,487	1,000	300 J	110 J	340 J	1,500	450 U	75 J	500 U	54 J	370 U	180 J	130 J	160 J
Di-n-butylphthalate	3 - 4	37	SJS05-SS38-000	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	11 - 32	560	SJS05-SS66-00-03D	714	410 U	60 J	410 U	87 J	260 J	450 U	570 U	500 U	440 U	370 U	420 U	380 U	400 U
Fluoranthene	26 - 32	1,600	SJS05-SS41-00-03D	2,766	750	390 J	100 J	290 J	1,300	450 U	120 J	500 U	49 J	370 U	210 J	180 J	220 J
Indeno(1,2,3-cd)pyrene	23 - 32	1,600	SJS05-SS66-00-03D	1,829	340 J	180 J	72 J	170 J	550	450 U	570 U	500 U	440 U	370 U	110 J	67 J	88 J
Naphthalene	4 - 32	77	SJS05-SS45-00-03D	485	410 U	400 U	410 U	510 U	480 U	450 U	570 U	500 U	440 U	370 U	420 U	380 U	400 U
Phenanthrene	20 - 32	390	SJS05-SS41-00-03D	913	190 J	110 J	410 U	67 J	280 J	450 U	77 J	500 U	440 U	370 U	72 J	380 U	110 J
Pyrene	27 - 32	1,100	SJS05-SS41-00-03D	2,590	990	360 J	110 J	230 J	720	47 J	110 J	500 U	53 J	370 U	160 J	170 J	210 J
Pesticide/Polychlorinated Biphenyls (UG/KG)																	
4,4'-DDD	21 - 28	33	SJS05-SS66-00-03D	5.3	4.2	4.7 J	1.7 J	51 U	4.7 U	4.5 U	57 U	5 U	8.7 J	18	16	2.4 J	13
4,4'-DDE	28 - 28	1,300	SJS05-SS59-00-03D	9	30	110	19	380	110	7.2 J	1,300	170	220	470	110	52	72
4,4'-DDT	28 - 28	1,400	SJS05-SS56-00-03D	21	5.9 J	17	12	1,400	140	4.2 J	350	44 J	52 J	220	87	15	13
Endosulfan sulfate	4 - 28	11	SJS05-SS53-00-03D	--	11 J	4 U	4.1 U	51 U	4.7 U	4.5 U	57 U	5 U	4.3 U	3.7 U	4.1 U	3.8 U	4.1 U
Endrin ketone	3 - 28	20	SJS05-SS53-00-03D	--	20	4 U	4.1 U	51 U	4.7 U	4.5 U	57 U	5 U	4.3 U	3.7 U	4.1 U	3.8 U	4.1 U
Total Metals (MG/KG)																	
Aluminum	32 - 32	22,200	SJS05-SS49-00-03D	22,786	8,820	4,330	1,740	21,300	9,770	8,070	8,580	7,690	4,900	4,940	18,700	3,680	9,250
Antimony	10 - 16	56.5	SJS05-SS44-00-03D	1.47	0.44 R	0.47 UL	0.4 UL	0.62 UL	0.49 UL	0.53 UL	0.6 UL	0.75 L	0.45 UL	0.41 R	0.46 R	0.42 R	0.42 R
Arsenic	32 - 32	136	SJS05-SS46-00-03D	24	4.4	2.2 J	0.88 J	14.7	12.8	2.8	3.7	4.9	6.8	8.6	4	2.3	7.6
Barium	32 - 32	23,900	SJS05-SS36-000	98	234	31.4 J	19.7 J	148	67.1	28.3 J	50.9 J	45.8 J	41.6 J	70.7	82.4	32.3 J	90
Beryllium	32 - 32	1	SJS05-SS52-00-03D	1	0.33 J	0.3 J	0.098 J	0.38 J	0.16 J	0.18 J	0.25 J	0.22 J	0.35 J	0.11 J	0.4 J	0.061 J	0.17 J
Cadmium	17 - 32	47.8	SJS05-SS38-000	--	0.3 J	0.047 U	0.04 U	0.062 U	0.049 U	0.053 U	0.06 U	0.05 U	0.06 J	0.41 J	0.1 J	0.45 J	0.86 J
Calcium	32 - 32	165,000	SJS05-SS51-00-03D	3,251	28,100 J	36,600	458 J	1,220 J	358 J	327 J	479 J	353 J	63,300	1,330 J	1,060 J	1,430 J	1,960 J
Chromium	32 - 32	81.3	SJS05-SS36-000	45	17.5	12.2	5.2	39.5	19.6	8.6	10.5	9.9	9.1	3.7	18.3	4	21.2
Cobalt	31 - 32	15.7	SJS05-SS66-00-03D	13	3.1 J	2.7 J	0.92 J	5.2 J	1.9 J	0.84 J	1.4 J	1.5 J	1.8 J	2.2 J	2.8 J	1.7 J	4.1 J
Copper	32 - 32	209,000	SJS05-SS44-00-03D	58	22.5 J	11 J	8.1 J	43.4 J	19.4 J	9.9 J	16.6 J	11.9 J	14.8 J	12.5 J	28.6 J	18.1 J	166 J
Cyanide	11 - 32	5.2	SJS05-SS51-00-03D	--	0.18 U	0.18 U	0.16 U	0.24 J	0.21 U	0.19 U	0.33 J	0.21 J	0.2 U	0.36 J	0.17 U	0.14 U	0.17 U
Iron	32 - 32	66,800	SJS05-SS38-000	45,805	13,600	6,810	2,700	34,300	27,200	5,780	7,420	6,090	7,810	8,220	13,400	8,340	18,400
Lead	32 - 32	2,950	SJS05-SS66-00-03D	147	80.7	58.1	41.4	135	56.2	37.9	109	57.3	53.4	27.4	43.3	69.8	228
Magnesium	32 - 32	9,820	SJS05-SS36-000	4,507	1,740	842 J	299 J	4,420	2,070	477 J	592 J	578 J	1,090 J	1,750	1,230	1,250	1,920
Manganese	32 - 32	1,870	SJS05-SS36-000	198	147	138 K	31.6 K	349 K	63.2 K	16.7 K	50.4 K	46.8 K	160 K	163	50.5	146	172
Mercury	25 - 32	0.69	SJS05-SS49-00-03D	1.3	0.13	0.061 U	0.06 U	0.36	0.36	0.066 J	0.16 J	0.076 U	0.14	0.14	0.19	0.055 U	0.63
Nickel	32 - 32	198	SJS05-SS44-00-03D	19	7.8 J	4.9 J	2.2 J	12.7	6.2 J	4.8 J	7.2 J	5.5 J	3.8 J	1.8 J	9.5	2.4 J	13
Potassium	26 - 32	3,690	SJS05-SS56-00-03D	4,577	1,290	504 J	226 B	3,690	2,980	276 B	492 B	403 B	598 J	1,320	661 J	891 J	1,260
Selenium	3 - 32	6.1	SJS05-SS44-00-03D	2.2	0.66 UL	0.71 U	0.6 U	0.92 U	0.74 U	0.8 U	0.91 U	0.75 U	0.67 U	0.62 UL	0.7 UL	0.63 UL	0.63 UL
Silver	29 - 32	23.4	SJS05-SS66-00-03D	0.67	2.2	1 J	0.34 J	4.7	3.8	0.85 J	1 J	0.84 J	1.2 J	1.3 J	2.1 J	1.3 J	2.8
Sodium	14 - 32	1,710	SJS05-SS42-00-03D	620	180 B	260 J	24.7 B	949 J	1,200 J	318 J	312 J	234 J	558 J	53.6 B	67.5 B	54 B	75.1 B
Thallium	11 - 32	7.7	SJS05-SS44-00-03D	--	0.57 J	1.3 J	0.4 U	0.62 U	0.49 U	0.53 U	0.6 U	0.51 J	0.94 J	0.41 U	0.46 U	0.42 U	0.42 U
Vanadium	32 - 32	67.2	SJS05-SS46-00-03D	70	31	16.1	14	60.3	35.8	24	37	32.7	16.5	12	28.3	8.4 J	26.3
Zinc	32 - 32	124,000	SJS05-SS44-00-03D	137	92.7	41.6 J	28 J	122 J	53.2 J	27 J	72.4 J	61.3 J	69.7 J	115	208	89.9	383

Notes:

Exceeds Background UTL

-- no criteria available

NA - not analyzed

B - analyte not detected above associated blank

J - estimated value

K - analyte present; value may be biased low

L - analyte present; value may be biased high

R - unreliable result

U - analyte not detected

[1] A duplicate sample was collected for this sample and the results provided are the maximum concentration between the sample and th

Table 3-1
Surface Soil Detections and Exceedances of Background UTLs
Site 5 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	Frequency of Detection	Max Value	Max Location	95% Background UTL	SJS05-SO66	SJS05-SO67	SJS05-SS36	SJS05-SS37	SJS05-SS38	SJS05-SS39
Sample ID					SJS05-SS66-00-03D	SJS05-SS67-00-03D	SJS05-SS36-000	SJS05-SS37-000[1]	SJS05-SS38-000	SJS05-SS39-000
Sample Date					12/10/03	12/10/03	11/04/02	11/04/02	11/04/02	11/04/02
Chemical Name										
Semi-volatile Organic Compounds (UG/KG)										
2,4-Dinitrotoluene	1 - 4	68	SJS05-SS36-000	--	NA	NA	68 J	400 U	420 U	440 U
2-Methylnaphthalene	1 - 32	57	SJS05-SS45-00-03D	--	1,300 U	420 U	440 U	400 U	420 U	440 U
4-Nitroaniline	1 - 4	460	SJS05-SS37-000	--	NA	NA	1,100 U	460 J	1,100 U	1,100 U
Acenaphthylene	13 - 32	540	SJS05-SS41-00-03D	246	1,300 U	420 U	21 J	95 J	18 J	440 U
Anthracene	11 - 32	450	SJS05-SS41-00-03D	462	1,300 U	420 U	23 J	150 J	18 J	440 U
Benzo(a)anthracene	25 - 32	1,500	SJS05-SS41-00-03D	2,027	230 J	78 J	55 J	230 J	55 J	27 J
Benzo(a)pyrene	25 - 32	910	SJS05-SS41-00-03D	1,785	640 J	71 J	72 J	210 J	62 J	35 J
Benzo(b)fluoranthene	27 - 32	2,700	SJS05-SS41-00-03D	3,197	2,300	190 J	86 J	240 J	77 J	31 J
Benzo(g,h,i)perylene	19 - 32	2,300	SJS05-SS66-00-03D	1,655	2,300	65 J	58 J	120 J	420 U	440 U
Benzo(k)fluoranthene	24 - 32	820	SJS05-SS41-00-03D	2,038	540 J	66 J	89 J	260 J	72 J	38 J
Carbazole	1 - 4	14	SJS05-SS37-000	--	NA	NA	440 U	14 J	420 U	440 U
Chrysene	22 - 32	2,200	SJS05-SS41-00-03D	3,487	410 J	130 J	83 J	280 J	90 J	33 J
Di-n-butylphthalate	3 - 4	37	SJS05-SS38-000	--	NA	NA	26 J	21 J	37 J	440 U
Dibenz(a,h)anthracene	11 - 32	560	SJS05-SS66-00-03D	714	560 J	420 U	440 U	38 J	420 U	440 U
Fluoranthene	26 - 32	1,600	SJS05-SS41-00-03D	2,766	350 J	120 J	80 J	210 J	180 J	49 J
Indeno(1,2,3-cd)pyrene	23 - 32	1,600	SJS05-SS66-00-03D	1,829	1,600	66 J	71 J	160 J	52 J	28 J
Naphthalene	4 - 32	77	SJS05-SS45-00-03D	485	1,300 U	420 U	440 U	12 J	420 U	440 U
Phenanthrene	20 - 32	390	SJS05-SS41-00-03D	913	140 J	72 J	31 J	45 J	49 J	25 J
Pyrene	27 - 32	1,100	SJS05-SS41-00-03D	2,590	1,300 U	100 J	61 J	240 J	150 J	47 J
Pesticide/Polychlorinated Biphenyls (UG/KG)										
4,4'-DDD	21 - 28	33	SJS05-SS66-00-03D	5.3	33	17	NA	NA	NA	NA
4,4'-DDE	28 - 28	1,300	SJS05-SS59-00-03D	9	170	200	NA	NA	NA	NA
4,4'-DDT	28 - 28	1,400	SJS05-SS56-00-03D	21	53	200	NA	NA	NA	NA
Endosulfan sulfate	4 - 28	11	SJS05-SS53-00-03D	--	9.3 J	4.1 U	NA	NA	NA	NA
Endrin ketone	3 - 28	20	SJS05-SS53-00-03D	--	6.6 U	4.1 U	NA	NA	NA	NA
Total Metals (MG/KG)										
Aluminum	32 - 32	22,200	SJS05-SS49-00-03D	22,786	18,100	7,200	9,930	2,090	4,920	3,190
Antimony	10 - 16	56.5	SJS05-SS44-00-03D	1.47	8 L	0.49 R	9.7 J	11.4 J	28 J	0.39 B
Arsenic	32 - 32	136	SJS05-SS46-00-03D	24	18.4	5.7	29.1	18.8	37.7 J	1.8 J
Barium	32 - 32	23,900	SJS05-SS36-000	98	991	52.8	23,900	579	642	104
Beryllium	32 - 32	1	SJS05-SS52-00-03D	1	0.72 J	0.2 J	0.42 J	0.13 J	0.27 J	0.14 J
Cadmium	17 - 32	47.8	SJS05-SS38-000	--	14.9	0.049 U	7.5	1.2 J	47.8 J	0.67 J
Calcium	32 - 32	165,000	SJS05-SS51-00-03D	3,251	21,300 J	550 J	9,080	1,630	4,420 J	1,710
Chromium	32 - 32	81.3	SJS05-SS36-000	45	66.3	14.9	81.3	32.7	37.3 J	8.7
Cobalt	31 - 32	15.7	SJS05-SS66-00-03D	13	15.7 J	1.9 J	5.7 J	2 J	3.4 J	0.78 B
Copper	32 - 32	209,000	SJS05-SS44-00-03D	58	99,700 J	235 J	690	906 J	192	14.4
Cyanide	11 - 32	5.2	SJS05-SS51-00-03D	--	0.52 J	0.15 U	NA	NA	NA	NA
Iron	32 - 32	66,800	SJS05-SS38-000	45,805	66,400	13,100	13,800	8,170	66,800 J	4,040
Lead	32 - 32	2,950	SJS05-SS66-00-03D	147	2,950	92.7	2,210	516	442	45.6
Magnesium	32 - 32	9,820	SJS05-SS36-000	4,507	4,440	1,190 J	9,820	601 J	1,240 J	537 J
Manganese	32 - 32	1,870	SJS05-SS36-000	198	697	53.2	1,870	110	393 J	40.5
Mercury	25 - 32	0.69	SJS05-SS49-00-03D	1.3	0.34	0.21	0.12 J	0.12 J	0.11 J	0.067 U
Nickel	32 - 32	198	SJS05-SS44-00-03D	19	107	5.6 J	11.2	7 J	10.9	3.5 J
Potassium	26 - 32	3,690	SJS05-SS56-00-03D	4,577	2,650	1,160 J	1,120 J	332 J	899 J	413 J
Selenium	3 - 32	6.1	SJS05-SS44-00-03D	2.2	1.1 UL	0.74 UL	1.5	0.71 U	2.1 J	0.77 U
Silver	29 - 32	23.4	SJS05-SS66-00-03D	0.67	23.4	2 J	0.34 J	0.19 U	0.2 U	0.21 U
Sodium	14 - 32	1,710	SJS05-SS42-00-03D	620	1,310 J	221 J	79.2 U	71.8 U	77.6 U	78.3 U
Thallium	11 - 32	7.7	SJS05-SS44-00-03D	--	3.1 J	0.49 U	0.62 U	0.57 U	3.3 J	0.62 U
Vanadium	32 - 32	67.2	SJS05-SS46-00-03D	70	35.4	20.5	22.8	12.7 J	28.3	12.9
Zinc	32 - 32	124,000	SJS05-SS44-00-03D	137	11,500	62.1	3,850	2,830	1,010	66.5

Notes:

Exceeds Background UTL

-- no criteria available

NA - not analyzed

B - analyte not detected above associated blank

J - estimated value

K - analyte present; value may be biased low

L - analyte present; value may be biased high

R - unreliable result

U - analyte not detected

[1] A duplicate sample was collected for this sample and the results provided are the maximum concentration between the sample and the

Table 3-2
Summary of Dioxin/Furan Exceedances of TEQs in Surface Soil
Site 5 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID		RBC-Soil Residential	SJS05-SO44			SJS05-SO50			SJS05-SO53			SJS05-SO66		
Sample ID			SJS05-SS44-00-03D			SJS05-SS50-00-03D			SJS05-SS53-00-03D			SJS05-SS66-00-03D		
Sample Date	TEF		12/10/03		TEQ	12/10/03		TEQ	12/10/03		TEQ	12/10/03		TEQ
Chemical Name														
Dioxin/Furans (UG/KG)														
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	0.01	0.43	0.056		0.00056	0.18		0.0018	0.09		0.0009	0.077		0.00077
1,2,3,4,6,7,8-Heptachlorodibenzofuran	0.01	0.43	0.084		0.00084	0.023		0.00023	0.01		0.0001	0.021		0.00021
1,2,3,4,7,8,9-Heptachlorodibenzofuran	0.01	0.43	0.0077		0.000077	0.0018	J	0.000018	1.00E-03	B	0.00001	0.0017	B	0.000017
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	0.01	0.043	0.0036	J	0.000036	0.0059	J	0.000059	0.0016	Q	0.000016	0.0032	J	0.000032
1,2,3,4,7,8-Hexachlorodibenzofuran	0.01	0.043	0.035		0.00035	0.0046	J	0.000046	0.0031	J	0.000031	0.0048	J	0.000048
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	0.1	0.043	0.0057	J	0.00057	0.0091		0.00091	0.0036	J	0.00036	0.0074	J	0.00074
1,2,3,6,7,8-Hexachlorodibenzofuran	0.1	0.043	0.013		0.0013	0.0056	J	0.00056	0.0016	J	0.00016	0.006	J	0.0006
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	0.1	0.043	0.0087		0.00087	0.017		0.0017	0.0053	J	0.00053	0.011		0.0011
1,2,3,7,8,9-Hexachlorodibenzofuran	0.1	0.043	9.00E-04	J	0.00009	3.70E-04	B	0.000037	2.40E-04	B	0.000024	4.30E-04	B	0.000043
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	0.5	0.0043	0.0035	J	0.00175	0.0044	J	0.0022	0.0013	J	0.00065	0.0035	J	0.00175
1,2,3,7,8-Pentachlorodibenzofuran	0.05	0.085	0.0073		0.000365	0.0041	J	0.000205	0.0016	J	0.00008	0.0064	J	0.00032
2,3,4,6,7,8-Hexachlorodibenzofuran	0.1	0.043	0.019		0.0019	0.0043	J	0.00043	0.0014	Q	0.00014	0.0062	J	0.00062
2,3,4,7,8-Pentachlorodibenzofuran	0.5	0.0085	0.011		0.0055	0.0042	J	0.0021	0.002	J	0.001	0.0078	J	0.0039
2,3,7,8-Tetrachlorodibenzofuran	0.1	0.043	0.0067	J	0.00067	0.0043	J	0.00043	0.0017	Q	0.00017	0.0096	J	0.00096
Total heptachlorodibenzo-p-dioxin			0.056			0.18			0.09			0.077		
Total heptachlorodibenzofuran			0.0917			0.0248			1.10E-02			0.0227		
Total hexachlorodibenzo-p-dioxin			0.018			0.032			0.0105			0.0216		
Total hexachlorodibenzofuran			6.79E-02			1.49E-02			6.34E-03			1.74E-02		
Total octachlorodibenzo-p-dioxin	0.001		0.38		0.00038	2.4		0.0024	0.86		0.00086	0.96		0.00096
Total octachlorodibenzofuran	0.001		0.1		0.0001	0.047		0.000047	0.011		0.000011	0.014	J	0.000014
Total pentachlorodibenzo-p-dioxin			0.0035	J		0.0044	J		0.0013	J		0.0035	J	
Total pentachlorodibenzofuran			0.0183			0.0083			0.0036			0.0142		
Total tetrachlorodibenzofuran			0.0067	J		0.0043	J		0.0017	Q		0.0096	J	
Total TEQ		0.0043			0.015358			0.013172			0.005042			0.012084

Notes:
Shaded cell indicates that the concentration of the compound exceeds its toxicity equivalent factor-adjusted RBC value
Shaded cell and bold cell indicates that the total TEQ of a sample exceeds the total TEQ for TEF-adjusted RBCs
Blank cell indicates there is no data
TEF = Toxicity equivalency factor, a TCDD equivalent number ranging from .5 to .00001
TEQ = Toxic Equivalency. For detected compounds, it is the product concentration multiplied by it's TEF.
Total TEQ for compounds - Sum of TEQs calculated for all compounds
RBC = Risk-Based Concentration
B = Analyte not detected above associated blank
I = Ether Interference
J = Reported value is estimated
NJ = Tentative identification, reported value is estimated.
Q = Estimated possible maximum concentration of dioxin furans

Table 3-3
Groundwater Detections and Exceedances of MCLs and Background UTLs
Site 5 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	95% Background UTL	MCL	SJS05-MW01D	SJS05-MW02S	SJS05-MW03S
Sample ID			SJS05-MW01D-03D[1]	SJS05-MW02S-03D[1]	SJS05-MW03S-03D
Sample Date			12/15/03	12/15/03	12/15/03
Chemical Name					
Explosives (UG/L)	--	--	Not Detected	NA	NA
Total Metals (UG/L)					
Aluminum	1,710	--	NA	21,800	11,400
Arsenic	8	10	NA	5.9 J	5.8 J
Barium	77.1	2,000	NA	22.8 J	19.8 J
Beryllium	1.4	4	NA	5.5	7.6
Cadmium	0.74	5	NA	2.2 J	4.8 J
Calcium	531,000	--	NA	58,200	65,600
Cobalt	15.8	--	NA	62.9	72.5
Copper	6.3	1,300	NA	20.1 J	1.4 B
Iron	107,000	--	NA	18,400	24,800
Lead	3.5	15	NA	9.8	6.4
Magnesium	296,000	--	NA	45,400	52,400
Manganese	13,700	--	NA	2,060	3,870
Nickel	20.1	--	NA	103	121
Potassium	85,400	--	NA	15,900	29,500
Silver	1.9	--	NA	0.81 J	1.4 J
Sodium	810,000	--	NA	269,000	90,200
Vanadium	13.7	--	NA	3.2 J	1.3 J
Zinc	241	--	NA	774	957
Dissolved Metals (UG/L)					
Aluminum	399	--	NA	22,400	11,400
Arsenic	2.4	10	NA	6.9 J	6 J
Barium	93.3	2,000	NA	27.3 J	22.1 J
Beryllium	0.31	4	NA	5.8	7.5
Cadmium	0.78	5	NA	2.4 J	5 J
Calcium	464,000	--	NA	60,300	65,300
Cobalt	15	--	NA	64.4	71.6
Copper	--	1,300	NA	25.5	4.8 B
Iron	94,000	--	NA	19,000 J	22,900 J
Lead	2.1	15	NA	12.7	7.8
Magnesium	256,000	--	NA	46,600 J	51,700 J
Manganese	11,800	--	NA	2,120 J	3,790 J
Nickel	13.2	--	NA	105	121
Potassium	73,300	--	NA	16,800 J	29,100 J
Silver	2.4	--	NA	0.8 J	1.6 J
Sodium	582,000	--	NA	273,000	87,700
Vanadium	7.1	--	NA	2.9 J	0.72 J
Zinc	109	--	NA	810	940

Notes:

Exceeds MCLs

Exceeds Background UTL

NA - Not Analyzed

-- no criteria available

B - analyte not detected above associated blank

J - estimated value

[1] A duplicate sample was collected for this sample and the results provided are the maximum concentration between the sample and the duplicate.

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SJS05-SS66	Conc.
SVOCs	
Benzo(g,h,i)perylene	2,300
Pesticide	
4,4'-DDD	33
4,4'-DDE	170
4,4'-DDT	53
Dioxin/Furan	
TEQ	0.012084
Metals	
Antimony	8 L
Barium	991
Chromium	66.3
Cobalt	15.7 J
Copper	99,700 J
Cyanide	0.52 J
Iron	66,400
Lead	2,950
Manganese	697
Nickel	107
Silver	23.4
Thallium	3.1 J
Zinc	11,500

SJS05-SS40	Conc.
Pesticide	
4,4'-DDD	7.3
4,4'-DDE	19
Metals	
Lead	832
Silver	1.3 J

SJS05-SS41	Conc.
SVOCs	
Acenaphthylene	540
Metals	
Silver	2.3 J
Thallium	0.6 J

SJS05-SS44	Conc.
Pesticide	
4,4'-DDE	370
4,4'-DDT	170
Dioxin/Furan	
TEQ	0.015358
Metals	
Antimony	56.5 L
Arsenic	40
Barium	1,380
Cadmium	11.1
Chromium	45.4
Copper	209,000 J
Cyanide	0.58 J
Lead	683
Manganese	723
Nickel	198
Selenium	6.1 L
Silver	19.8
Thallium	7.7
Zinc	124,000

SJS05-SS46	Conc.
Pesticide	
4,4'-DDD	23
4,4'-DDE	59
4,4'-DDT	24
Metals	
Antimony	44.7 L
Arsenic	136
Barium	16,500
Cadmium	9.2
Chromium	51
Copper	555 J
Lead	1,000
Manganese	297
Silver	4.4 J
Zinc	2,160

SJS05-SS42	Conc.
Pesticide	
4,4'-DDE	18
Metals	
Manganese	558 K
Silver	3.5

SJS05-SS43	Conc.
Pesticide	
4,4'-DDD	6.8
4,4'-DDT	36
Metals	
Arsenic	24.1
Barium	171
Cadmium	0.73 J
Copper	63.3 J
Silver	2.5 J
Zinc	2,100

SJS05-SS45	Conc.
Pesticide	
4,4'-DDD	11
4,4'-DDE	190
4,4'-DDT	26
Metals	
Barium	282
Silver	2.7

SJS05-SS67	Conc.
Pesticide	
4,4'-DDD	17
4,4'-DDE	200
4,4'-DDT	200
Metals	
Copper	235 J
Silver	2 J

SJS05-SS47	Conc.
Pesticide	
4,4'-DDD	25
4,4'-DDE	820
4,4'-DDT	130 J
Metals	
Barium	104
Lead	520
Silver	2.9

SJS05-SS65	Conc.
Pesticide	
4,4'-DDD	13
4,4'-DDE	72
Metals	
Cadmium	0.86 J
Copper	166 J
Lead	228
Silver	2.8
Zinc	383

SJS05-SS36	Conc.
Metals	
Antimony	9.7 J
Arsenic	29.1
Barium	23,900
Chromium	81.3
Copper	690
Lead	2,210
Manganese	1,870
Zinc	3,850

SJS05-SS37	Conc.
Metals	
Antimony	11.4 J
Barium	579
Copper	906 J
Lead	516
Zinc	2,830

BLDG. 272

SJS05-SS64	Conc.
Pesticide	
4,4'-DDE	52
Metals	
Cadmium	0.45 J
Silver	1.3 J

SJS05-SS39	Conc.
Metals	
Barium	104

SJS05-SS49	Conc.
Pesticide	
4,4'-DDD	9.7
4,4'-DDE	270
4,4'-DDT	180
Endrin ketone	5.6 J
Metals	
Barium	112
Copper	60.3 J
Cyanide	0.25 J
Lead	557
Silver	6.1

SJS05-SS63	Conc.
Pesticide	
4,4'-DDD	16
4,4'-DDE	110
4,4'-DDT	87
Metals	
Cadmium	0.1 J
Silver	2.1 J
Zinc	208

SJS05-SS51	Conc.
Pesticide	
4,4'-DDD	18
4,4'-DDE	160
Metals	
Cadmium	0.16 J
Cyanide	5.2
Manganese	265
Silver	1 J
Thallium	1.5 J

SJS05-SS48	Conc.
Pesticide	
4,4'-DDE	30
Metals	
Antimony	1.7 L
Barium	717
Cadmium	4.1
Copper	92.4 J
Cyanide	0.21 J
Lead	259
Manganese	255
Silver	2.4
Thallium	0.52 J
Zinc	469

SJS05-SS62	Conc.
Pesticide	
4,4'-DDD	18
4,4'-DDE	470
4,4'-DDT	220
Metals	
Cadmium	0.41 J
Cyanide	0.36 J
Silver	1.3 J

BLDG. 131

BLDG. 132

SJS05-SS52	Conc.
Pesticide	
4,4'-DDD	14.1
4,4'-DDE	51.1
4,4'-DDT	39.2
Metals	
Barium	3,350
Cadmium	3.2
Copper	138 J
Cyanide	0.54 J
Lead	502
Nickel	71.1
Silver	2 J
Thallium	0.52 J
Zinc	1,870

SJS05-SS38	Conc.
Metals	
Antimony	28 J
Arsenic	37.7 J
Barium	642
Copper	192
Iron	66,800 J
Lead	442
Manganese	393 J
Zinc	1,010

SJS05-SS50	Conc.
Pesticide	
4,4'-DDD	23
4,4'-DDE	370
4,4'-DDT	160
Endrin ketone	11
Dioxin/Furan	
TEQ	0.013172
Metals	
Barium	121
Copper	148 J
Cyanide	0.21 J
Lead	157
Silver	4.7

SJS05-SS61	Conc.
Pesticide	
4,4'-DDD	8.7 J
4,4'-DDE	220
4,4'-DDT	52 J
Metals	
Cadmium	0.06 J
Silver	1.2 J
Thallium	0.94 J

SJS05-SS55	Conc.
Pesticide	
4,4'-DDE	19

SJS05-SS54	Conc.
Pesticide	
4,4'-DDE	110
Metals	
Silver	1 J
Thallium	1.3 J

SJS05-SS53	Conc.
Pesticide	
4,4'-DDE	30
Endrin ketone	20
Dioxin/Furan	
TEQ	0.005042
Metals	
Barium	234
Cadmium	0.3 J
Silver	2.2
Thallium	0.57 J

SJS05-SS60	Conc.
Pesticide	
4,4'-DDE	170
4,4'-DDT	44 J
Metals	
Cyanide	0.21 J
Silver	0.84 J
Thallium	0.51 J

SJS05-SS59	Conc.
Pesticide	
4,4'-DDE	1,300
4,4'-DDT	350
Metals	
Cyanide	0.33 J
Silver	1 J

SJS05-SS57	Conc.
SVOCs	
Acenaphthylene	380 J
Pesticide	
4,4'-DDE	110
4,4'-DDT	140
Metals	
Silver	3.8

SJS05-SS56	Conc.
Pesticide	
4,4'-DDE	380
4,4'-DDT	1,400
Metals	
Barium	148
Cyanide	0.24 J
Manganese	349 K
Silver	4.7

SJS05-SS58	Conc.
Metals	
Silver	0.85 J

Chemical Name	Background 95% UTL for Dredge Fill Soils
SVOCs (ug/kg)	
Acenaphthylene	246
Benzo(g,h,i)perylene	1,655
Pesticide (ug/kg)	
4,4'-DDD	5.3
4,4'-DDE	9
4,4'-DDT	21
Endrin ketone	ND
Metals (mg/kg)	
Antimony	1.47
Arsenic	24
Barium	98
Cadmium	ND
Chromium	45
Cobalt	13
Copper	58
Cyanide	ND
Iron	45,805
Lead	147
Manganese	198
Nickel	19
Selenium	2.2
Silver	0.67
Thallium	ND
Zinc	137

LEGEND

- Surface Soil Sample Locations
- Sample was also analyzed for Dioxin/Furan
- Site 5 Waste/Burnt Soil Area
- Site 5 Boundary

Notes:
J - Analyte present. Reported value may not be accurate or precise.
K - Analyte present. Reported value may be biased high.
L - Analyte present. Reported value may be biased low.
TEQ - Toxic Equivalency. For detected compounds, it is the product concentration multiplied by its TEF.
UTL - Upper Tolerance Level
Organic concentrations area in ug/kg.
Inorganic concentrations are in mg/kg.

N

0 175 350 Feet

Figure 3-1
Surface Soil Exceedances of Background UTLs
Site 5 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

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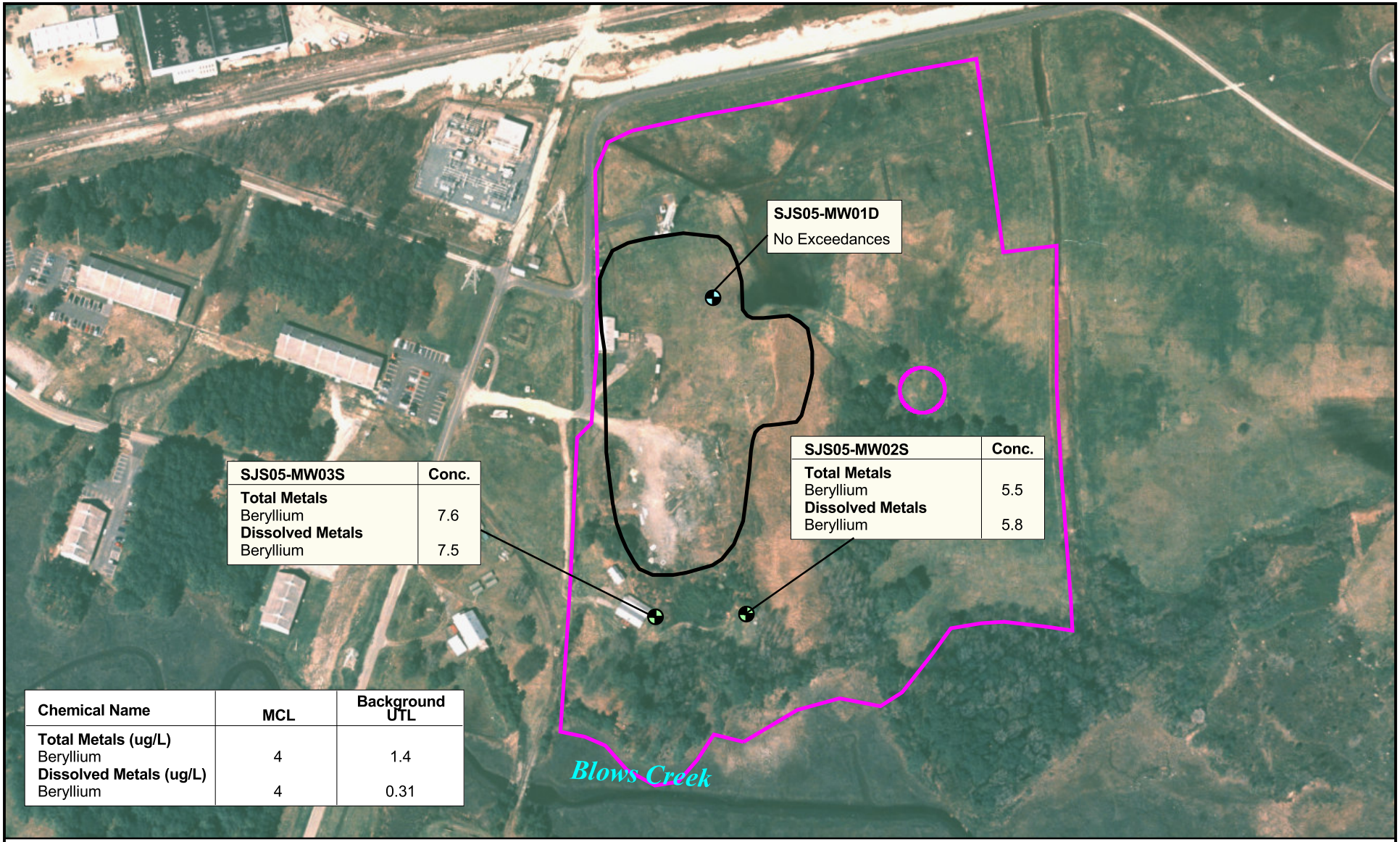

LEGEND

- Shallow Groundwater Sampling Locations
- Deep Groundwater Sampling Locations
- Site 5 Waste/Burnt Soil Area
- Site 5 Boundary

Notes:
MCL - Maximum Contaminant Level
Concentrations in ug/L

N

0 200 400 Feet

Figure 3-2
Groundwater MCL Exceedances
Site 5 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

SECTION 4

Human Health Risk Assessment Addendum

This HHRA addendum includes an evaluation of Site 5 surface soil and groundwater. The surface soil data collected during the ERI were combined with the surface soil data evaluated in the RI to re-evaluate risks to potential human receptors. Because the Baseline HHRA conducted during the RI did not identify any risks above EPA target levels associated with exposure to subsurface soil, subsurface soil was not evaluated in this addendum.

Shallow groundwater (Columbia Aquifer) is not considered a regional potable water source at or in the vicinity of SJCA due to its poor quality and low yield. Therefore, during the RI (CH2M HILL, March 2003), human health risks were only evaluated for a construction worker scenario based on dermal contact. However, because the site soils and waste are being considered for removal with the intent of achieving unlimited use and unrestricted exposure (UU/UE) for the site, the shallow groundwater data were evaluated for exposure by a future child and lifetime (child/adult) resident.

The revised HHRA surface soil evaluation is presented in subsection 4.1 and the revised HHRA shallow groundwater evaluation is presented in subsection 4.2.

4.1 Surface Soil

4.1.1 Methodology

The HHRA addendum for Site 5 surface soil is comprised of the following components:

- **Identification of Chemicals of Potential Concern (COPCs) –** identifies and characterizes the distribution of COPCs found on the site
- **Exposure Assessment** - identifies potential pathways by which exposure could occur; characterizes the potentially exposed populations; and estimates the magnitude, frequency, and duration of exposure
- **Toxicity Assessment –** identifies the types of adverse health effects associated with exposure to COPCs and lists available toxicity factors for COPCs
- **Risk Characterization –** identifies sources of uncertainty associated with the data, methodology, and the values used in the risk assessment estimation

Identification of COPCs

The identification of COPCs includes data collection, data evaluation, and data screening steps. The data collection and evaluation steps involve gathering and reviewing the available site data and identifying the set of data that is of acceptable quality for the risk assessment. The data set is then screened against concentrations that are protective of human health to reduce the data set to those chemicals and media of potential concern. The

data that were used for the quantitative risk analysis were all validated prior to use. Table 4-1 lists the samples evaluated in this HHRA, which include the surface soil samples collected during the RI and ERI.

The validated data were used in the same manor they were used in the baseline HHRA, as follows:

- Estimated values flagged with a J qualifier were treated as unqualified detected concentrations
- Data qualified with an R (rejected) were not used in the risk assessment
- Data qualified with a B (blank contamination) was used in the risk assessment as if it is non-detect and the blank-related concentration for the constituent was used as the sample quantitation limit. One-half of the sample detection limit (DL) was used in the risk assessment to calculate exposure point concentrations
- For duplicate samples, the higher of the two concentrations was used as the sample concentration
- One-half the sample DL was used to calculate the exposure point concentration for samples with no detectable contaminant quantities if the contaminant was detected in other samples from the data grouping

All of the detected constituents were screened in accordance with criteria presented in EPA guidelines (EPA, January 1993). The maximum detected concentration of each constituent detected in surface soil at Site 5 was compared to a screening value, as discussed below, to select the COPCs. If the maximum detected concentration exceeded the screening value, the constituent was selected as a COPC and retained for the quantitative risk evaluation. The COPC screening is presented in the Appendix E, Tables 2.1 through 2.4. The data were screened using the same methodology used in the baseline HHRA. However, the EPA Region III RBCs were updated to reflect the most recent RBC table (EPA, April 2004).

- **Comparison with RBCs:** The maximum detected chemical concentrations in surface soil were compared with the EPA Region III soil RBCs (EPA, April 2004). The screening-level RBCs for noncarcinogens were adjusted to reflect a target hazard quotient of 0.1. The screening-level RBCs for carcinogens are based on a target cancer risk of $1x10^{-6}$ and were not adjusted from the values included in the RBC table. The EPA Region III Industrial Soil RBCs were used to screen the surface soil for the trespasser and other worker scenarios (Appendix E, Tables 2.1 and 2.2) and the EPA Region III Residential Soil RBCs were used to screen the surface soil for the residential scenario (Appendix E, Tables 2.3 and 2.4).
- **Comparison for Lead:** Lead concentrations of less than 400 mg/kg in soil are considered adequately protective of human health under residential land-use conditions. Exceedance of these values prompts further evaluation to assess the potential for human-health impacts. The lead soil-screening level of 400 mg/kg was used to screen the soil.
- **Comparison with Recommended Dietary Allowances (RDAs):** Chemicals which are human nutrients, present at low concentrations (i.e., only slightly elevated above

naturally occurring levels), and toxic only at very high doses were eliminated from the quantitative risk analysis. These constituents are calcium, magnesium, potassium, and sodium.

Table 4-2 identifies the surface soil COPCs retained in this ERI. The COPCs for the trespasser and industrial scenarios generally include the same COPCs that were retained in the baseline HHRA, with the addition of two PAHs and eight metals. The COPCs for the residential scenario generally include the same COPCs as were retained for the baseline HHRA, with the addition of two PAHs and one metal.

4.1.2 Exposure Assessment

The exposure scenarios that were evaluated in the baseline HHRA for soil were evaluated in this risk assessment and are summarized in Appendix E, Table 1.

Site 5, a former burning ground, is an open field and is currently not being actively used at the base. The grassy area is regularly mowed and the adjacent patrol road is accessible and occasionally utilized as an exercise path by base personnel. Because this area is not fenced, base workers and trespassers/visitors could have access to Site 5 surface soil and are the only current receptors that could be exposed to the surface soil.

Future land use at Site 5 is potentially either industrial or commercial. Future residential development of this site is unlikely; however, it is evaluated as the most conservative future use of the site. Therefore, exposure to surface soil by potential future adult and child residents was evaluated. Noncarcinogenic risks were calculated for adult and child residents separately, and carcinogenic risks were calculated for lifetime residents (not separately for children and adults).

As for the current site use, the surface soil is also accessible to trespassers and other workers under future site use.

The exposure parameters used to quantify risks are the same as the exposure parameters used in the baseline HHRA and are included in Appendix E, Table 4s.

The methodology used to calculate the exposure point concentrations (EPCs) in this addendum was updated from the methodology used in the baseline HHRA to current EPA practices. The reasonable maximum exposure (RME) EPCs for the surface soil were calculated as the 95 percent upper confidence limit (95% UCL), the 97.5% UCL, or the 99% UCL of the arithmetic mean concentration. The maximum detected concentration was used in place of the appropriate UCL as the EPC when the calculated UCL was greater than the maximum detected value or less than five samples were available for the data grouping.

ProUCL, Version 2.1 (EPA, February 2003), was used to calculate the UCLs and determine the distribution the data fit. The ProUCL model uses the Shapiro-Wilk W-test to determine if the data fit a lognormal or normal distribution for data sets with 50 samples or less. For data sets with greater than 50 samples, ProUCL uses Lilliefors test to determine if the data fit a lognormal or normal distribution. The distribution that the data fit is then used to choose the method that ProUCL uses to calculate the UCL. The recommendations outlined in the ProUCL model documentation were used to select the appropriate UCL. For data that were determined to fit a normal distribution, the student's t-statistic was used to calculate

the 95% UCL. For data determined to fit a lognormal distribution, either Land's H-statistic was used to calculate the 95% UCL, or the Chebyshev Theorem using the minimum variance unbiased estimator (MVUE) of the parameters was used to calculate the 95% UCL or 99% UCL, depending on the standard deviation of the population. For data that fit neither a lognormal or normal distribution, the Chebyshev Theorem using the arithmetic mean and standard deviation was used to calculate the 95% UCL, 97.5% UCL, or 99% UCL, depending on the population standard deviation. For data sets that fit both a lognormal and normal distribution, the methods described above for the distribution with the higher W-value was used to calculate the UCL.

The average concentration was used as the CT EPC. For data that fit a lognormal distribution (based on the discussion above), the MVUE of the mean was used as the CT EPC. For data that fit a normal distribution, the average of the non-transformed data was used as the CT EPC. For data sets that either fit both a lognormal and normal distribution, or fit neither a lognormal or normal distribution, the average of the non-transformed data was used to calculate the UCL.

The exposure point concentrations are included in Appendix E, Table 3s.

Toxicity Assessment

The sources of the toxicity values used in the baseline HHRA were used for this addendum. However, if the toxicity values have been updated since the RI/HHRA/ERA was completed, the updated values were used in this addendum.

The primary source for toxicity values used in the risk assessment is the EPA's Integrated Risk Information System (IRIS) database. IRIS includes only reference doses (RfDs) and slope factors (SFs) that have been verified by EPA work-groups. If data were not available from IRIS, National Center for Environmental Assessment (NCEA) data were used. The health effects assessment summary tables (EPA, 1997), which are issued by EPA's Office of Research and Development, were consulted when data were not available in IRIS or from NCEA. If no toxicity values were available for a detected constituent, surrogate constituents were selected and their RBCs were used for the COPC selection process. None of the constituents exceeded the surrogate constituents RBCs.

Per EPA guidance, oral toxicity values (RfDs and SFs) were adjusted from administered dose to absorbed dose for evaluating dermal toxicity. The RfD and SF were adjusted using oral absorption factors from EPA (EPA, September 2001). The adjusted dermal RfDs and SFs, along with the oral RfDs and SFs, are summarized in Appendix E, Tables 5.1 and 6.1. The inhalation RfDs and SFs are summarized in Appendix E, Tables 5.2 and 6.2.

Most chemicals detected at the site have toxicity factors or appropriate surrogates. In this assessment, lead is the only COPC without available published toxicity factors. Lead is regulated by EPA based on blood-lead uptake using a physiologically based pharma-kokinetic model referred to as the Integrated Exposure Uptake Biokinetic (IEUBK) model, in the event of excess lead presence at the site. As a screening tool, lead is screened at 400 mg/kg in soil.

Risk Characterization

Risk characterization is the process of integrating the previous elements of the risk assessment into quantitative and semi-quantitative expressions of risk. The calculated risk is then used as an integral component in remedial decision-making and selection of potential remedies or actions.

Potential human health risks are discussed independently for carcinogenic and noncarcinogenic contaminants because of the different toxicological endpoints, relevant exposure duration, and methods used to characterize risk. The noncarcinogenic health impacts from carcinogens are also assessed. The methods used to estimate the noncarcinogenic hazards and carcinogenic risks are detailed in the baseline HHRA, and are summarized here.

Noncarcinogenic Risk Estimation

Noncarcinogenic health risks are estimated by comparing actual or expected exposure levels to threshold concentrations (or noncarcinogenic RfDs). The expected intake divided by the RfD is equal to the hazard quotient (HQ):

$$HQ = Intake / RfD$$

The intake and RfD are expressed in the same units and represent the same exposure period (i.e., chronic or subchronic). The intake and RfD also represent the same exposure route, (i.e., inhalation intakes are divided by the inhalation RfD). When the HQ exceeds one (i.e., exposure exceeds the RfD), a certain degree of health risk is indicated. To assess the potential for noncarcinogenic health effects posed by exposure to multiple chemicals and multiple exposure pathways a "hazard index" approach is used (EPA, December 1989). This approach assumes that noncarcinogenic hazards associated with exposure to more than one chemical and pathway are additive. Synergistic or antagonistic interactions between chemicals are not accounted for. The hazard index (HI) may exceed one even if all of the individual HQs are less than one. The chemicals may then be segregated by similar mechanisms of toxicity and toxicological effects, and separate HIs derived based on mechanism and target organs affected.

Carcinogenic Risk Estimation

The potential for carcinogenic effects due to exposure to site-related contamination is evaluated by estimating excess lifetime cancer risk. Excess lifetime carcinogenic risk is the incremental increase in the probability of developing cancer during one's lifetime in addition to the background probability of developing cancer.

The carcinogenic risk is calculated by multiplying the intake by the cancer slope factor (CSF).

$$CR = Intake \times CSF$$

The combined risk from exposure to multiple chemicals at a site was evaluated by adding the risks from individual chemicals. Risks were also added across the pathways, if an individual would be exposed through multiple pathways.

When a cumulative carcinogenic risk to an individual receptor under the assumed exposure conditions exceeds 100 in a million (10^{-4} excess cancer risk), Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) generally requires remedial action to reduce risks at the site. If the cumulative risk is less than 10^{-4}, action generally is not required, but may be warranted if a risk-based chemical-specific standard, for example, MCL, is exceeded. A risk-based remedial decision could be superseded by the presence of an environmental impact requiring action at the site.

4.1.3 Surface Soil HHRA Results

Appendix E presents the tables used to evaluate the human health risks associated with exposure to Site 5 surface soil. Tables 4-3, 4-4, 4-5, and 4-6 summarize the results of the risk assessment.

- **Current/Future Adult Trespasser(noncarcinogenic hazard and carcinogenic risk**) Table 9.1.RME, Appendix E, summarizes the hazard and carcinogenic risk to the current/future adult trespasser.

  The RME noncarcinogenic hazard to the adult trespasser (0.25) is below EPA's target HI of 1.0. The RME carcinogenic risk (4.9×10^{-6}) is within EPA's target risk range of 10^{-6} to 10^{-4}.

- **Current/Future Adolescent Trespasser (noncarcinogenic hazard and carcinogenic risk**) Table 9.2.RME, Appendix E, summarizes the hazard and carcinogenic risk to the current/future adolescent Trespasser.

  The RME noncarcinogenic hazard to the adolescent trespasser (0.28) is below EPA's target HI of 1.0. The RME carcinogenic risk (1.1×10^{-6}) is within EPA's target risk range of 10^{-6} to 10^{-4}.

- **Current/Future Adult Other Worker (noncarcinogenic hazard and carcinogenic risk**) Table 9.3.RME, Appendix E, summarizes the hazard and carcinogenic risk to the future adult other worker based on exposure to COPCs selected using the EPA industrial soil RBCs.

  The RME noncarcinogenic hazard to the other worker (0.58) is below EPA's target HI of 1.0. The RME carcinogenic risk (9.2×10^{-6}) is within EPA's target risk range of 10^{-6} to 10^{-4}.

  The results of the adult lead model for the Site 5 surface soil are summarized in Table 4-7. As shown in the table, the highest 95th percentile blood lead concentration among fetuses of adult workers is 5.5 μg/dL (micrograms of lead per deciliter blood). The probability that the fetal lead blood concentration would be greater than the target blood lead concentration of 10 μg/dL is less than 5 percent. Therefore, exposure to lead in surface soil is not a health concern for the fetuses of other workers.

- **Future Adult Resident (noncarcinogenic hazard)**
  Table 9.5.RME, Appendix E, summarizes the hazard to the future adult resident. The RME noncarcinogenic hazard to the adult resident (2.0) is above EPA's target HI of 1.0. The hazard is mainly associated with the ingestion of copper which alone poses an HI of 1.0. None of the other constituents contribute an individual HI greater than 1.0.

Because the cumulative RME hazard exceeded 1.0, a CT hazard was calculated (Table 9.8.CT). The CT noncarcinogenic hazard for the adult resident (0.56) is below EPA's target HI.

- **Future Child Resident (noncarcinogenic hazard)**
  Table 9.6.RME, Appendix E, summarizes the hazard to the future child resident. The RME noncarcinogenic hazard to the child resident (15) is above EPA's target HI of 1.0. The hazard is mainly associated with the ingestion of copper, with a smaller contribution from arsenic and iron.

  Because the cumulative RME hazard exceeded 1.0, a CT hazard was calculated (Table 9.9.CT). The CT noncarcinogenic hazard for the child resident (4.7) is also above EPA's target HI. The hazard is associated with the ingestion of copper.

  The results of the IEUBK model for Site 5 surface soil are summarized in Table 4-7. The IEUBK evaluation resulted in a geometric mean blood concentration of 5.8 μg/dL for children 0 to 84 months old. Approximately 11.8 percent of this population had a blood lead level above EPA's recommended level of 10 μg/dL. EPA only considers lead in soil not to be a health concern if less than 5 percent of the population has a blood-lead level greater than 10 μg/dL. Therefore, exposure to lead in surface soil at Site 5 may be a potential health concern for residential children.

- **Future Lifetime Resident (carcinogenic risk)**
  Table 9.7.RME, Appendix E, summarizes the carcinogenic risks to the future lifetime resident. The RME carcinogenic risk associated with exposure to surface soil ($8.4x10^{-5}$) is within EPA's target risk range of 10^{-6} to 10^{-4}.

4.1.4 Uncertainty

The risk measures used in Superfund site risk assessments are not fully probabilistic estimates of risk but are conditional estimates given that a set of assumptions about exposure and toxicity are realized. Thus it is important to specify the assumptions and uncertainties inherent in the risk assessment to place the risk estimates in proper perspective (EPA, 1989a). A site-specific discussion on the uncertainties associated with the individual components of the HHRA is presented in the following sections.

General Uncertainty in COPC Selection

The purpose of the ERI was to collect surface soil data to further delineate surface soil contamination, fill data gaps, and support evaluation of potential remedial alternatives. Therefore, the uncertainty in sampling and possibility of missing a contaminated location is expected to be minimal. The uncertainty associated with the data analysis is minimal, as the data have been fully validated prior to use in the risk assessment. The general assumptions used in the COPC selection process were conservative to ensure that the true COPCs were not eliminated from the quantitative risk assessment and that the highest possible risk was estimated.

Background data were not used to select the COPCs, adding another source of uncertainty in the identification of COPCs. The 95% UTLs for Dredge Fill surface soil are included in Tables 2.1 through 2.4, in Appendix E.

Nine out of 12 maximum detected concentrations of COPCs selected for Site 5 using industrial RBCs (all of the metal COPCs) were above background UTLs. Using the residential RBCs, 14 out of 22 maximum detected concentrations of COPCs selected were above background UTLs. Elimination of these constituents as COPCs, based on a comparison to background, would not change the results of the Site 5 risk analysis.

Uncertainty Associated with Exposure Assessment

Some of the exposure pathways evaluated in the risk assessment are assumed, and exposure factors used for quantitation of exposure are conservative and reflect the worst-case or upper-bound assumptions. Use of these exposure factors results in over-estimation of actual site risk.

The percent of a chemical absorbed through the skin is likely to be affected by many parameters, including soil loading, soil moisture content, organic content, pH, and presence of other constituents. The availability of a chemical for absorption through the skin depends on site-specific fate and transport properties of the chemical species available for eventual absorption of skin. Chemical concentrations, specific properties of the chemical, and soil release kinetics all impact the amount of a chemical absorbed. These factors contribute to the uncertainty associated with dermal absorption estimates and make quantitation of the amount of certain chemicals absorbed from soil difficult.

Uncertainty Associated with Toxicity Assessment

Uncertainty associated with the noncarcinogenic toxicity factors is included in Standard Tables 5.1 and 5.2 in Appendix E. The uncertainty associated with CSFs is mostly associated with the low dose extrapolation where carcinogenicity at low doses is assumed to be straight-line responses. This is a conservative assumption, which introduces a high uncertainty into SFs, which are from this extrapolated area of the dose-response curve. Most of the experimental studies indicate existence of a threshold for carcinogenicity, which is not accounted for in the development of the CSF.

Carcinogenic SFs developed by the EPA represent upper bound estimates. Any carcinogenic risks generated in this assessment should be regarded as an upper bound estimate on the potential carcinogenic risks rather than an accurate representation of carcinogenic risk. The true carcinogenic risk is likely to be less than the predicted value.

Additional uncertainty is in the prediction of relative sensitivities of different species of animals and the applicability of animal data to humans.

There is a large degree of uncertainty associated with the oral to dermal adjustment factors (based on chemical-specific gastrointestinal absorption) used to transform the oral RFDs and CSFs based on administered doses to dermal RFDs and CSFs based on absorbed doses. It is not known if the adjustment factors result in an underestimate or overestimate of the actual toxicity associated with dermal exposure.

Uncertainty in Risk Characterization

The uncertainties identified in each component of risk assessment ultimately contribute to uncertainty in risk characterization. The addition of risks and HIs across pathways and chemicals contributes to uncertainty based on the interaction of chemicals such as additivity,

synergism, potentiation, and susceptibility of exposed receptors. The simple assumption of additivity used for this assessment may or may not be accurate and may or may not over- or under-estimate risk, however, a better alternative is not available at this time.

The draft 2001 trichloroethene toxicity values (EPA, August 2001) were not used in the risk assessment. Risks were calculated using the 1986 trichloroethene toxicity values that have been withdrawn from IRIS. When risks are calculated using the draft 2001 trichloroethene toxicity values, there are still no risks greater than EPA target levels associated with exposure to trichloroethene. The contribution from trichloroethene to the total risks and hazards are very small and will not change the results of this risk assessment.

4.2 Shallow Groundwater

The baseline HHRA was conducted to evaluate the potential human health risks associated with exposure of a future child and lifetime resident to constituents detected in shallow groundwater. Figure 2-5 shows the shallow monitoring well locations and general shallow groundwater flow direction at Site 5. The Revised HHRA for shallow groundwater was presented to the SJCA Project Management Team separately and is provided as Appendix F of this ERI. Appendix F, Table 1 provides the groundwater data collected to-date at Site 5.

4.2.1 Methodology

RME and CT exposure risk estimates were calculated following EPA guidance. Only metals were evaluated because the concentrations of organics did not exceed human health RBCs. When comparing the concentrations of total (un-filtered) metal to the dissolved (filtered) metal results, there is no notable difference in the concentrations for aluminum, iron, and manganese (EPA, August 1992). Therefore, the total metal concentrations were used for evaluation.

In general, the baseline HHRA methodology described in the RI/HHRA/ERA (CH2MHILL, March 2003) was followed. At the time the HHRA was conducted, the latest EPA Region III RBC table (EPA, October 2004) was used as a source of screening values. In addition, EPCs for detected constituents selected as COPCs were calculated using the latest version (v. 3.00.02) of EPA's ProUCL software (EPA, 2004). In addition, EPA's latest guidance (EPA, 2003b) for choosing the source(s) of toxicity values (used to calculate cancer and noncancer risks) was followed. The hierarchy for the source of toxicity values was as follows: (1) IRIS (EPA, 2003a), (2) Provisional Peer-Reviewed Toxicity Values (PPRTV), (3) NCEA, and (4) Health Effects Assessment Tables (HEAST). This hierarchy is according to EPA's most recent guidance for sources of toxicity values (EPA, 2003b).

4.2.2 Shallow Groundwater HHRA Results

Potable use of shallow groundwater by future child residents would result in an RME (HI=43) and CTE (HI-16) non cancer hazard above EPA's acceptable target HI of 1. The potential RME hazards are based on ingestion of aluminum (HI = 3.1), arsenic (HI = 2.3), cadmium (HI = 1.4), iron (HI = 11), manganese (HI =14), thallium (HI = 1.9), and vanadium (HI = 1.8) and dermal contact with manganese (HI =2.3). The potential CTE hazards are based on ingestion of iron (HI =5.9) and manganese (HI =5.9) (Appendix F, Table 2).

The RME cancer risk ($2.4x10^{-4}$) to the future lifetime resident was slightly above EPA's target cancer risk range ($1x10^{-4}$ to $1x10^{-6}$) due to ingestion of arsenic. However, the CTE cancer risk ($5.4x10^{-5}$) is within the target cancer risk range (Appendix F, Table 2).

4.3 Summary

4.3.1 Surface Soil

There are no risks above EPA target risk levels under current land use (trespassers or site workers). There are no risks above EPA target risk levels for future industrial use of the site (trespassers or other workers). Future residential land use may result in an unacceptable non cancer risk due to ingestion of copper and arsenic.

Additionally, based on the IEUBK evaluation for lead, exposure to lead in surface soil at Site 5 may be a potential health concern for residential children. Average lead concentrations of less than 400 mg/kg in surface soil across the site are considered adequately protective of human health under residential land-use conditions. Individual lead concentrations exceeded 400 mg/kg at 17 locations across the site. However, based on the average concentration (505 mg/kg) of lead detected in surface soil at Site 5, the two most elevated detections contribute to the elevated average.

The following sample locations and respective concentrations pose the potential risk to human health from exposure to surface soil at Site 5:

Sample Location	COC	Concentration
SJS05-SS01	Copper	6,470 mg/kg
	Iron	120,000 mg/kg
	Lead	7,210 mg/kg
SJS05-SS09	Arsenic	111 K mg/kg
SJS05-SS11	Arsenic	152 mg/kg
SJS05-SS19	Lead	4,740 mg/kg
SJS05-SS38	Iron	66,800 mg/kg
SJS05-SS44	Copper	209,000 J mg/kg
SJS05-SS46	Arsenic	136 mg/kg
SJS05-SS66	Copper	99,700 J mg/kg
	Iron	66,400 mg/kg

4.3.2 Shallow Groundwater

Metals concentrations in shallow groundwater may pose an unacceptable non cancer hazard and cancer risk to future residents. Due to the variability in analytical results in shallow groundwater over time, additional metals sampling data is recommended from the existing monitoring wells to re-evaluate the potential risks to construction workers and future residents.

Table 4-1
Summary of Data Quantitatively Used in Risk Assessment
Site 5 Surface Soil
St. Juliens Creek Annex
Chesapeake, Virginia

Medium	Date of Sampling	Sample	Parameters
Soil			
Surface Soil	6/24/1997	SJS05-SS01-000	METAL, SVOA, VOA, PEST/PCB
	6/26/1997	SJS05-SS02-000	METAL, SVOA, VOA, PEST/PCB
	6/26/1997	SJS05-SS03-000	METAL, SVOA, VOA, PEST/PCB
	6/26/1997	SJS05-SS04-000	METAL, SVOA, VOA, PEST/PCB
	6/26/1997	SJS05-SS05-000	METAL, SVOA, VOA, PEST/PCB
	6/26/1997	SJS05-SS06-000	EXPLO, METAL, SVOA, VOA, PEST/PCB
	6/26/1997	SJS05-SS07-000	EXPLO, METAL, SVOA, VOA, PEST/PCB
	6/26/1997	SJS05-SS07-000P	EXPLO
	6/26/1997	SJS05-SS08-000	METAL, SVOA, VOA, PEST/PCB
	6/26/1997	SJS05-SS09-000	METAL, SVOA, VOA, PEST/PCB
	4/21/1999	SJS05-SS10-000	EXPLO, METAL, SVOA, VOA, PEST/PCB
	4/21/1999	SJS05-SS11-000	EXPLO, METAL, SVOA, VOA, PEST/PCB
	4/22/1999	SJS05-SS12-000	EXPLO, METAL, SVOA, VOA, PEST/PCB
	4/21/1999	SJS05-SS13-000	EXPLO, METAL, SVOA, VOA, PEST/PCB
	4/22/1999	SJS05-SS14-000	EXPLO, METAL, SVOA, VOA, PEST/PCB
	4/21/1999	SJS05-SS15-000	EXPLO, METAL, SVOA, VOA, PEST/PCB
	4/22/1999	SJS05-SS16-000	EXPLO, METAL, SVOA, VOA, PEST/PCB
	4/22/1999	SJS05-SS17-000	EXPLO, METAL, SVOA, VOA, PEST/PCB
	4/22/1999	SJS05-SS18-000	EXPLO, METAL, SVOA, VOA, PEST/PCB
	4/22/1999	SJS05-SS19-000	EXPLO, METAL, SVOA, VOA, PEST/PCB
	4/22/1999	SJS05-SS20-000	EXPLO, METAL, SVOA, VOA, PEST/PCB
	4/22/1999	SJS05-SS21-000	EXPLO, METAL, SVOA, VOA, PEST/PCB
	4/22/1999	SJS05-SS22-000	EXPLO, METAL, SVOA, VOA, PEST/PCB
	4/22/1999	SJS05-SS23-000	EXPLO, METAL, SVOA, VOA, PEST/PCB
	4/22/1999	SJS05-SS24-000	EXPLO, METAL, SVOA, VOA, PEST/PCB
	4/22/1999	SJS05-SS25-000	EXPLO, METAL, SVOA, VOA, PEST/PCB
	4/22/1999	SJS05-SS26-000	EXPLO, METAL, SVOA, VOA, PEST/PCB
	4/22/1999	SJS05-SS27-000	EXPLO, METAL, SVOA, VOA, PEST/PCB
	4/22/1999	SJS05-SS27-000P	EXPLO, METAL, SVOA, VOA, PEST/PCB
	4/22/1999	SJS05-SS28-000	EXPLO, METAL, SVOA, VOA, PEST/PCB
	4/19/1999	SJS05-SS30-000	EXPLO, METAL, SVOA, VOA, PEST/PCB
	4/19/1999	SJS05-SS31-000	EXPLO, METAL, SVOA, VOA, PEST/PCB
	4/19/1999	SJS05-SS32-000	EXPLO, METAL, SVOA, VOA, PEST/PCB
	4/22/1999	SJS05-SS33-000	EXPLO, METAL, SVOA, VOA, PEST/PCB
	4/22/1999	SJS05-SS34-000	EXPLO, METAL, SVOA, VOA, PEST/PCB
	4/22/1999	SJS05-SS35-000	EXPLO, METAL, SVOA, VOA, PEST/PCB
	11/4/2002	SJS05-SS36-000	METAL, SVOA
	11/4/2002	SJS05-SS37-000	METAL, SVOA
	11/4/2002	SJS05-SS37-000P	METAL, SVOA
	11/4/2002	SJS05-SS38-000	METAL, SVOA
	11/4/2002	SJS05-SS39-000	METAL, SVOA
	12/11/2003	SJS05-SS40-00-03D	METAL,SVOA, PEST/PCB
	12/11/2003	SJS05-SS41-00-03D	METAL,SVOA, PEST/PCB
	12/11/2003	SJS05-SS42-00-03D	METAL,SVOA, PEST/PCB
	12/11/2003	SJS05-SS42-00-03D-P	METAL,SVOA, PEST/PCB
	12/10/2003	SJS05-SS43-00-03D	METAL,SVOA, PEST/PCB
	12/10/2003	SJS05-SS44-00-03D	METAL,SVOA, PEST/PCB, DIOXINS/FURANS
	12/10/2003	SJS05-SS45-00-03D	METAL,SVOA, PEST/PCB
	12/10/2003	SJS05-SS46-00-03D	METAL,SVOA, PEST/PCB
	12/10/2003	SJS05-SS47-00-03D	METAL,SVOA, PEST/PCB
	12/10/2003	SJS05-SS48-00-03D	METAL,SVOA, PEST/PCB
	12/10/2003	SJS05-SS48-00-03D-P	METAL,SVOA, PEST/PCB
	12/10/2003	SJS05-SS49-00-03D	METAL,SVOA, PEST/PCB
	12/10/2003	SJS05-SS50-00-03D	METAL,SVOA, PEST/PCB, DIOXINS/FURANS
	12/10/2003	SJS05-SS50-00-03D-P	METAL,SVOA, PEST/PCB, DIOXINS/FURANS
	12/10/2003	SJS05-SS51-00-03D	METAL,SVOA, PEST/PCB
	12/10/2003	SJS05-SS52-00-03D	METAL,SVOA, PEST/PCB
	12/10/2003	SJS05-SS53-00-03D	METAL,SVOA, PEST/PCB, DIOXINS/FURANS
	12/10/2003	SJS05-SS54-00-03D	METAL,SVOA, PEST/PCB

Table 4-1
Summary of Data Quantitatively Used in Risk Assessment
Site 5 Surface Soil
St. Juliens Creek Annex
Chesapeake, Virginia

Medium	Date of Sampling	Sample	Parameters
	12/10/2003	SJS05-SS55-00-03D	METAL,SVOA, PEST/PCB
	12/11/2003	SJS05-SS56-00-03D	METAL,SVOA, PEST/PCB
	12/11/2003	SJS05-SS57-00-03D	METAL,SVOA, PEST/PCB
	12/11/2003	SJS05-SS58-00-03D	METAL,SVOA, PEST/PCB
	12/11/2003	SJS05-SS59-00-03D	METAL,SVOA, PEST/PCB
	12/11/2003	SJS05-SS60-00-03D	METAL,SVOA, PEST/PCB
	12/11/2003	SJS05-SS61-00-03D	METAL,SVOA, PEST/PCB
	12/10/2003	SJS05-SS62-00-03D	METAL,SVOA, PEST/PCB
	12/10/2003	SJS05-SS63-00-03D	METAL,SVOA, PEST/PCB
	12/10/2003	SJS05-SS64-00-03D	METAL,SVOA, PEST/PCB
	12/10/2003	SJS05-SS65-00-03D	METAL,SVOA, PEST/PCB
	12/10/2003	SJS05-SS66-00-03D	METAL,SVOA, PEST/PCB, DIOXINS/FURANS
	12/10/2003	SJS05-SS67-00-03D	METAL,SVOA, PEST/PCB

Table 4-2
Summary of Chemicals of Potential Concern for HHRA
Site 5 Surface Soil
St. Juliens Creek Annex
Chesapeake, Virginia

Surface Soil	
Industrial RBCs	**Residential RBCs**
Benzo(a)pyrene	Benzo(a)anthracene
Dibenz(a,h)anthracene	Benzo(a)pyrene
Antimony	Benzo(b)fluoranthene
Arsenic	Dibenz(a,h)anthracene
Barium	Indeno(1,2,3-cd)pyrene
Chromium	4,4'-DDE
Copper	4,4'-DDT
Iron	2,3,7,8-TCDD (dioxin equivalent)
Lead	Aluminum
Thallium	Antimony
Zinc	Arsenic
	Barium
	Cadmium
	Chromium
	Copper
	Iron
	Lead
	Manganese
	Nickel
	Thallium
	Vanadium
	Zinc

Table 4-3
Summary of Media-Specific Risks and Hazards RMEs
Site 5
St. Juliens Creek Annex
Chesapeake, Virginia

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks >10^{-4}	Chemicals with Cancer Risks >10^{-5} and <10^{-4}	Chemicals with Cancer Risks >10^{-6} and <10^{-5}	Hazard Index	Chemicals with HI>1
Current/Future Trespasser - Adult	Surface Soil	Ingestion	3.6E-06			Arsenic	0.20	
		Dermal Contact	1.4E-06				0.05	
		Inhalation	1.9E-09				0.0001	
		Total	4.9E-06				0.25	
	All Media	Total	4.9E-06				0.25	
Current/Future Trespasser - Adolescent	Surface Soil	Ingestion	8.9E-07				0.25	
		Dermal Contact	1.6E-07				0.03	
		Inhalation	4.2E-10				0.0001	
		Total	1.1E-06				0.28	
	All Media	Total	1.1E-06				0.28	
Current/Future Other Worker	Surface Soil	Ingestion	7.1E-06			Arsenic	0.49	
		Dermal Contact	2.1E-06			Arsenic	0.09	
		Inhalation	NA				NA	
		Total	9.2E-06				0.58	
	All Media	Total	9.2E-06				0.58	
Future Resident - Adult	Surface Soil	Ingestion	NA				1.5	Copper
		Dermal Contact	NA				0.54	
		Inhalation	NA				NA	
		Total	NA				2.0	
	All Media	Total	NA				2.0	
Future Resident - Child	Surface Soil	Ingestion	NA				13.6	Arsenic, Copper, Iron
		Dermal Contact	NA				1.1	
		Inhalation	NA				NA	
		Total	NA				14.7	
	All Media	Total	NA				15	
Future Resident - Lifetime	Surface Soil	Ingestion	7.1E-05		Arsenic	Benzo(a)pyrene, Benzo(b)fluoranthene Dibenz(a,h)anthracene, Dioxin equivalent	NA	
		Dermal Contact	1.3E-05			Benzo(a)pyrene, Dibenz(a,h)anthracene, Arsenic	NA	
		Inhalation	NA				NA	
		Total	8.4E-05				NA	
	All Media	Total	8.4E-05				NA	

NA - Not applicable, pathway incomplete.

Table 4-4
Summary of Media-Specific Risks and Hazard CTs
Site 5
St. Juliens Creek Annex
Chesapeake, Virginia

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks >10^{-4}	Chemicals with Cancer Risks >10^{-5} and <10^{-4}	Chemicals with Cancer Risks >10^{-6} and <10^{-5}	Hazard Index	Chemicals with HI>1
Future	Surface Soil	Ingestion	NA				0.49	
Resident - Adult		Dermal Contact	NA				0.07	
		Inhalation	NA				NA	
		Total	NA				0.56	
	All Media	Total	NA				0.56	
Future	Surface Soil	Ingestion	NA				4.5	Copper
Resident - Child		Dermal Contact	NA				0.17	
		Inhalation	NA				NA	
		Total	NA				4.7	
	All Media	Total	NA				4.7	
Future	Surface Soil	Ingestion	1.9E-05		Arsenic	Dioxin equivalent	NA	
Resident - Lifetime		Dermal Contact	1.1E-06				NA	
		Inhalation	NA				NA	
		Total	2.0E-05				NA	
	All Media	Total	2.0E-05				NA	

NA - Not applicable, pathway incomplete.

Table 4-5
Summary Table for Risks and Hazards Across Media for All RMEs
Site 5
St. Juliens Creek Annex
Chesapeake, Virginia

	Exposure Scenarios				Exposure Scenarios	
	Surface Soil		Total Risk for Pathways	Total HI for Pathways	Surface Soil	
	Risk	HI			% Risk	% HI
Current/Future Trespasser Adult	4.9E-06	2.5E-01	**4.9E-06**	**2.5E-01**	100%	100%
Current/Future Trespasser Adolescent	1.1E-06	2.8E-01	**1.1E-06**	**2.8E-01**	100%	100%
Current/Future Other Worker- Industrial	9.2E-06	5.8E-01	**9.2E-06**	**5.8E-01**	100%	100%
Future Resident Adult	NA	2.0E+00	**NA**	**2.0E+00**	NA	100%
Future Resident Child	NA	1.5E+01	**NA**	**1.5E+01**	NA	100%
Future Age-Adjusted Resident	8.4E-05	NA	**8.4E-05**	**NA**	100%	NA

Table 4-6
Summary Table for Risks and Hazards Across Media for All CTs
Site 5
St. Juliens Creek Annex
Chesapeake, Virginia

	Exposure Scenarios				Exposure Scenarios	
	Surface Soil		Total Risk for Pathways	Total HI for Pathways	Surface Soil	
	Risk	HI			% Risk	% HI
Future Resident Adult	NA	5.6E-01	**NA**	**5.6E-01**	NA	100%
Future Resident Child	NA	4.7E+00	**NA**	**4.7E+00**	NA	100%
Future Age-Adjusted Resident	2.0E-05	NA	**2.0E-05**	**NA**	100%	NA

Table 4-7
Calculations of Blood Lead Concentrations (PbBs)
Site 5
St. Juliens Creek Annex
Chesapeake, Virginia

Version date 2/19/03

Exposure Variable	PbB Equation[1] 1*	PbB Equation[1] 2**	Description of Exposure Variable	Units	Values for Non-Residential Exposure Scenario: Using Equation 1 GSDi = Hom	Using Equation 1 GSDi = Het	Using Equation 2 GSDi = Hom	Using Equation 2 GSDi = Het
PbS	X	X	Soil lead concentration	ug/g or ppm	504.96	504.96	504.96	504.96
$R_{fetal/maternal}$	X	X	Fetal/maternal PbB ratio	--	0.9	0.9	0.9	0.9
BKSF	X	X	Biokinetic Slope Factor	ug/dL per ug/day	0.4	0.4	0.4	0.4
GSD_i	X	X	Geometric standard deviation PbB	--	1.9	2.3	1.9	2.3
PbB_0	X	X	Baseline PbB	ug/dL	1.4	1.8	1.4	1.8
IR_S	X		Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050	0.050	--	--
IR_{S+D}		X	Total ingestion rate of outdoor soil and indoor dust	g/day	--	--	0.050	0.050
W_S		X	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--	--	1.0	1.0
K_{SD}		X	Mass fraction of soil in dust	--	--	--	0.7	0.7
$AF_{S,D}$	X	X	Absorption fraction (same for soil and dust)	--	0.12	0.12	0.12	0.12
$EF_{S,D}$	X	X	Exposure frequency (same for soil and dust)	days/yr	219	219	219	219
$AT_{S,D}$	X	X	Averaging time (same for soil and dust)	days/yr	365	365	365	365
PbB_{adult}	**PbB of adult worker, geometric mean**			**ug/dL**	**2.1**	**2.5**	**2.1**	**2.5**
$PbB_{fetal,\ 0.95}$	**95th percentile PbB among fetuses of adult workers**			**ug/dL**	**5.5**	**9.0**	**5.5**	**9.0**
PbB_t	**Target PbB level of concern (e.g., 10 ug/dL)**			**ug/dL**	**10.0**	**10.0**	**10.0**	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**			**%**	**0.5%**	**3.8%**	**0.5%**	**3.8%**

[1] Equation 1 does not apportion exposure between soil and dust ingestion (excludes W_S, K_{SD}).
When $IR_S = IR_{S+D}$ and $W_S = 1.0$, the equations yield the same $PbB_{fetal,0.95}$.

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

***Equation 1, based on Eq. 1, 2 in USEPA (1996).**

PbB_{adult} =	$(PbS*BKSF*IR_{S+D}*AF_{S,D}*EF_S/AT_{S,D}) + PbB_0$
$PbB_{fetal,\ 0.95}$ =	$PbB_{adult} * (GSD_i^{1.645} * R)$

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

SECTION 5

Ecological Risk Assessment Addendum

This section presents a Screening Ecological Risk Assessment (SERA) and Step 3 of the BERA for Site 5 surface soil. The surface soil samples collected during the ERI were combined with the surface soil samples evaluated in the ERA as part of the RI/HHRA/ERA report (CH2M HILL, March 2003a) to re-evaluate risks to potential ecological receptors. The objective of the ERI was to further delineate surface soil contamination, fill data gaps, and support evaluation of potential remedial alternatives.

The SERA, which constitutes Steps 1 and 2 of the 8-step ERA process, was conducted in accordance with the *Navy Policy for Conducting Ecological Risk Assessments* (CNO, 1999), the Navy guidance for implementing this ERA policy (NAVFAC, February 2001), and the Navy/Tier II ERA approach developed for EPA Region III. This approach is generally consistent with the Navy/Tier II ERA approach developed for Region III and the general approach developed by the EPA for conducting ERAs (EPA, 1997). The objectives of the SERA are to:

- Determine if (1) assessment is necessary beyond the conservative screening steps of the ERA process (ecological risks possible), (2) one or more sites can be removed from further ecological consideration (no potential ecological risks), and (3) one or more chemicals can be eliminated from further evaluation based on the absence of potential exposure pathways or a potential site-related risk.
- Identify potential data gaps or unacceptable uncertainty requiring the collection of additional data to support ERA evaluations beyond the screening level.

At the conclusion of the SERA, there are four possible decision points:

- **No further action is warranted**. This decision is appropriate if the SERA indicates that sufficient data are available on which to base a conclusion of no unacceptable risk with acceptable uncertainty.
- **Further evaluation is warranted**. This decision is appropriate if the SERA indicates that there is the potential for unacceptable risks for some pathways, receptors, and chemicals. In this instance, the ERA would progress to Step 3 of the 8-step process.
- **Further data are required.** This decision is appropriate if the SERA indicates that there are insufficient data on which to base a risk estimate. This decision may also be appropriate if the potential for unacceptable risks is identified following the SERA and additional data to refine these estimates (e.g., additional analytical data, measures of bioavailability, etc.) are needed for Step 3.
- **Remedial action required**. This decision may be appropriate for circumstances in which the potential for unacceptable risks was identified following the SERA but these potential risks could best be addressed through remedial action (e.g., presumptive remedy, soil removal) rather than additional study.

Since the results of the SERA indicated the potential for unacceptable risks (see Section 5.3), this evaluation also includes the first step (Step 3) of the BERA. The CNO policy, which describes a process consisting of eight steps organized into three tiers, is an interpretation of the 8-step process outlined in EPA ERA guidance for the Superfund program (EPA, 1997). The major differences between the Navy ERA policy and the EPA ERA guidance are: (1) the Navy policy provides clearly defined criteria for exiting the ERA process at specific points, (2) the Navy policy divides Step 3 (the first step of the baseline ERA) into two distinct sub-steps (Steps 3A and 3B), with a potential exit point after Step 3A, and (3) the Navy policy incorporates risk management considerations throughout all tiers of the ERA process.

In Step 3A, a refined evaluation of media concentrations and exposure estimates is conducted using more realistic assumptions and additional methodologies relative to those used in the SERA, which is intended to be a very conservative assessment. If risk estimates (and their associated uncertainty) are acceptable following Step 3A, the site will meet the conditions of the exit criterion specified in the Navy guidance and the ERA process is complete. If the Step 3A evaluation does not support an acceptable risk determination, the site continues to Step 3B. In Step 3B, the preliminary conceptual model presented in the SERA is refined based on the results of Step 3A to develop a revised list of receptors, COPCs, assessment endpoints, and measurement endpoints. Based upon the revised conceptual model, the lines of evidence to be used in characterizing risk are determined. The revised problem formulation serves as a basis for development of necessary site-specific studies (Step 4) if they are needed. The SERA and Step 3A are presented as follows:

- **Section 5.1—Facility Background and Environmental Setting.** Describes the environmental setting (e.g., physiographic features, habitats and biota) of the SJCA and Site 5.
- **Section 5.2—General Approach and Methodology**. Develops the preliminary problem formulation for Site 5 and outlines and describes the specific technical approaches, methodologies, models, and parameter values that are used in the SERA for the exposure estimation, effects evaluation, and risk calculation. This section describes the approaches used in Step 2 and the refinements of conservative exposure assumptions used in Step 3A.
- **Section 5.3—Chemical Concentrations and Risk Calculations (Steps 2 and 3A).** Provides summaries of the media-specific/site-specific chemical data, a summary of the SERA and Step 3A risk calculation results (i.e., HQs) and a list of COPCs. Uncertainties associated with risk estimates are discussed in this section.
- **Section 5.4—Problem Formulation Revision (Step 3B).** Further characterizes and evaluates the potential ecological risks indicated in Step 3A by comparing site-related chemical concentrations to available background concentrations and characterizing the distribution of chemicals associated with the site. Identifies complete exposure pathways and revises assessment endpoints and risk hypotheses/questions based on the outcomes of the Step 3A risk calculations and Problem Formulation Revision.

5.1 Facility Background and Environmental Setting

This section describes the environmental setting (e.g., physiographic features, habitats and biota) of the SJCA, with emphasis on Site 5.

5.1.1 Physiographic Features

Soils on and in the vicinity of Site 5 have been surveyed and identified as Dredge Fill soils, that represent former sediment or river/stream bank material removed from the Southern Branch of the Elizabeth River and possibly Blows Creek. This soil is comprised of silty or sandy material and is typically poorly drained.

An upland drainage ditch, which is aligned approximately north/south, carries storm water to the south towards Blows Creek. Wetland communities, which comprise approximately 5 percent of the Site 5 habitat area, are associated with this drainage ditch.

5.1.2 Habitats and Biota

This section provides a general overview of the terrestrial, wetland, and aquatic habitats and biota present at SJCA and a detailed description of the habitats present on Site 5 (Figure 2-1). Information regarding rare, threatened and endangered species is also presented in this section.

The habitats within and adjacent to Site 5 include grassland, scrub/shrub, wetlands, and forested. The majority of the site is mowed grassland (approximately 75 percent of Site 5 total habitat area; located in the northern portion of the site), gravel and/or paved (approximately 15 percent of the total habitat area), scrub/shrub (approximately 5 percent of Site 5 total habitat area; along the transition to the grassland at the southern edge of the site), and isolated forest (approximately 5 percent of Site 5 total habitat area; located to the west of the site).

The mowed grass fields associated with Site 5 are dominated by pioneering species that can exist in degraded habitats, such as crab grass, Kentucky bluegrass, and deer tongue. Scrub/shrub habitats represent another important habitat type, occurring mostly as transitional zones between forested areas and grassy fields and in previously disturbed but unmowed areas. Scrub/shrub habitats are comprised mostly of raspberry, poison ivy, honeysuckle, and Virginia creeper.

Forested communities around Site 5 typically represent fringes of larger communities that extend offsite to adjacent areas. The forested area canopy consists of loblolly pine, sweet gum, red oak, red cedar, tree of heaven, northern catalpa, and white mulberry. The sub-canopy consists of black locust, black cherry, choke cherry, and silver maple. Green briar, poison ivy, Virginia creeper, honeysuckle, and saplings of the canopy and sub-canopy trees make up the majority of the groundcover.

The primary water body in the vicinity of Site 5 is Blows Creek, a tributary to the Southern Branch of the Elizabeth River. This tidally-influenced brackish water body is located to the south of Site 5. Blows Creek receives periodic discharge (primarily during storm events) from multiple upland drainages within this basin.

A drainage ditch aligned approximately north/south carries storm water to the south towards Blows Creek. Emergent wetlands, which comprise approximately 5 percent of the habitat area, are present along this inland drainage and within some seasonally flooded depressions. The inland wetland areas associated with this drainage and the depressions are dominated by common reed, phragmites, high-tide bush, wax myrtle, and/or a variety of grasses. The drainage is dry throughout much of the year and would be expected to provide habitat for only highly opportunistic species (i.e., tolerant and transient aquatic species).

The grassy and woodland habitats at Site 5 are expected to support a variety of soil invertebrates (e.g., insects and earthworms) and a variety of small mammals such as mice, shrew, and squirrel. Small mammals in the grassy field, scrub/shrub and forested habitats likely forage on a variety of invertebrate and plant material (e.g., seeds, nuts, berries, etc.). A variety of larger mammals, such as the gray fox, are known to occur in this area and are expected to feed on small mammals and birds. A diversity of bird species are known to frequent SJCA. Birds such as blackbirds, crow, towhee, dove, vireo and bobwhite can be supported by the invertebrates and vegetation in upland habitats. Avian predators such as the osprey, kestrel, red-tailed hawk also have been observed at SJCA. Osprey feed primarily on fish, while hawk and kestrel feed primarily on small mammals, birds, reptiles, and insects. A representative list of the terrestrial and wetland wildlife species known or expected to occur on the sites being evaluated is provided in Appendix M of the RI/HHRA/ERA Report (CH2M HILL, March 2003a).

5.1.3 Rare, Threatened, and Endangered Species

Rare, threatened, and endangered species information was requested from the Virginia Department of Conservation and Recreation, Division of Natural Heritage (DNH), the Commonwealth of Virginia Department of Game and Inland Fisheries, Office of Plant and Pest Services, and the U. S. Fish and Wildlife Service (USFWS). Correspondence with these agencies can be seen in Appendix M of the RI/HHRA/ERA Report (CH2M HILL, March 2003a). These results were updated and verified by checking the DNH, Virginia Department of Game and Inland Fisheries, and USFWS web sites for rare and endangered species (http://www.dcr.virginia.gov/dnh/nhrinfo.htm, http://www.dgif.state.va.us/wildlife/index.cfm, and http://endangered.fws.gov/). This information, in conjunction with the earlier reports, indicates that no rare, threatened, or endangered wildlife species are known to occur at SJCA, with the possible exception of occasional transient species.

The following three listed species reside or migrate through southeastern Virginia and could periodically occur at SJCA:

- **Peregrine falcon (*Falco peregrinus*)-** Listed as endangered in the Commonwealth of Virginia, the peregrine falcon can be found in coastal areas during migration, particularly in September and October. In addition, hacking stations (release areas) have been established for the peregrine falcon on the Eastern Shore and in Back Bay National Wildlife Refuge.
- **Bald eagle (*Haliaeetus leucocephalus*)—** This species is listed as endangered in the Commonwealth of Virginia and threatened in portions of the lower 48 United States. The bald eagle was proposed for removal from the federal list in July 1999. Virginia

provides prime habitat for the bald eagle. In 1978, 37 active nests were located in the state. There are currently no known bald eagles nesting within SJCA. Some eagles, however, do winter along area beaches or pass through the region during migration.

- **Swainson's warbler (*Limnothlypis swainsonii*)**—This species is known to inhabit areas with abundant giant cane. However, this habitat does not occur at SJCA, limiting the potential for this species to occur onsite.

According to the DNH report, no natural heritage resources have been documented within a 2-mile radius of the SJCA. Outside of the 2-mile radius several natural heritage resources were documented. A list of these species is provided in Appendix M of the RI/HHRA/ERA Report (CH2M HILL, March 2003a).

5.2 General Approach and Methodology

The following sections develop the approach and methodology that was used in the SERA and Step 3A evaluation of surface soil at Site 5. This section first develops the screening-level problem formulation for Site 5 (Section 5.2.1). The problem formulation, and associated conceptual model, identifies transport and exposure pathways/routes, measurement/assessment endpoints, the risk hypotheses, and surrogate receptors. Following development of the problem formulation, the approach for calculating risk to potential ecological receptors from direct exposure to chemicals and from exposure to chemicals accumulated in the food web is established. This includes a description of the approach for identifying/calculating toxicity values for screening potential effects (Section 5.2.2), estimating exposure of receptors to chemicals via direct contact and food web exposure (Section 5.2.3), and calculating risk for both direct contact and food web scenarios using SERA assumption (Section 5.2.4). The final section (Section 5.2.5) describes the approach for recalculating risk with Step 3A risk model assumptions.

5.2.1 Screening-Level Problem Formulation

The problem formulation establishes the goals, scope, and focus of the SERA. As part of problem formulation, a conceptual model is developed that describes potential sources, potential transport pathways, potential exposure pathways and routes, and potential receptors associated with each site. Assessment endpoints, measurement endpoints, and risk hypotheses are then selected to evaluate receptors for which complete and potentially significant exposure pathways are likely to exist. The fate and transport of the chemicals present at a site are also considered during this process.

Important components of the preliminary conceptual model include the identification of potential contaminant sources, transport pathways, exposure media, potential exposure routes, and potential receptor groups. The following section develops a conceptual model for Site 5.

Transport Pathways

A transport pathway describes the mechanisms whereby chemicals may be transported from a source of contamination to ecologically relevant media. Potentially complete pathways identified in this section are subsequently evaluated in the ERA.

Chemicals are likely to have entered surface soil at Site 5 via direct release from historic activities. As discussed above, viable terrestrial habitats occur throughout this site and terrestrial life could be exposed to chemicals in this media. Once present in surface soil, chemicals have the potential to reach subsurface soil via infiltration. Subsurface soil is considered inaccessible to most wildlife and was not selected as an exposure medium for evaluation in the SERA.

Chemicals in subsurface soil could infiltrate into groundwater. Chemicals in groundwater are considered inaccessible to wildlife. However, chemicals in groundwater have the potential to move towards Blows Creek, where they could discharge and become available to aquatic life. Potential impacts to aquatic life from the surrounding watershed are being considered separately as part of the Blows Creek BERA.

Exposure Pathways and Routes

An exposure pathway links a source of contamination with one or more receptors. Exposure, and thus potential risk, can only occur if complete exposure pathways exist. A discussion of these pathways and routes that are evaluated in the SERA is provided in this section.

An exposure route describes the specific mechanism(s) by which a receptor is exposed to a chemical present in an environmental medium. Terrestrial plants may be exposed through their root surfaces during water and nutrient uptake to chemicals present in surface soils.

Animals may be exposed to chemicals through: (1) the inhalation of gaseous chemicals or of chemicals adhered to particulate matter; (2) the incidental ingestion of contaminated abiotic media (e.g., soil) during feeding activities; (3) the ingestion of contaminated water; (4) the ingestion of contaminated plant and/or animal tissues for chemicals which have entered the food chain; and/or (5) dermal contact with contaminated abiotic media. These exposure routes, where applicable, are also depicted in the preliminary conceptual models.

Based on the expected fate properties (e.g., relatively high adsorption to solids) of the chemicals commonly present on these sites (generally metals and PAHs) and the protection offered by hair or feathers, dermal and inhalation exposures for upper trophic level receptor species are not considered significant relative to ingestion exposures and are therefore not evaluated in the SERA. Incidental ingestion of soil during feeding, preening, or grooming activities is, however, considered in the risk estimates. Direct contact is considered for lower trophic level receptors (e.g., invertebrates).

Although soils are the focus of this Site 5 re-evaluation, the direct ingestion of surface water also represents a viable exposure pathway for terrestrial wildlife. Because the ingestion of surface water represents a potentially important component in the total chemical load to which wildlife receptors might be exposed, and surface water is (at least periodically) available on Site 5, it was included in food web model calculations.

Endpoints and Risk Hypotheses

The conclusion of the screening-level problem formulation includes the selection of ecological endpoints, which are based on the conceptual model. Two types of endpoints, assessment endpoints and measurement endpoints, are defined as part of the ERA process as are risk hypotheses or risk questions (EPA, 1992, 1997, 1998). An assessment endpoint is

an explicit expression of the environmental component or value that is to be protected. A measurement endpoint is a measurable ecological characteristic that is related to the component or value chosen as the assessment endpoint. The considerations for selecting assessment and measurement endpoints are summarized in EPA (1992, 1997) and discussed in detail in Suter (1989, 1990, 1993). Risk hypotheses are testable hypotheses about the relationship among the assessment endpoints and their predicted responses when exposed to contaminants.

Endpoints in the SERA define ecological attributes that are to be protected (assessment endpoints) and a measurable characteristic of those attributes (measurement endpoints) that can be used to gauge the degree of impact that has or may occur. Assessment endpoints most often relate to attributes of biological populations or communities, and are intended to focus the risk assessment on particular components of the ecosystem that could be adversely affected by chemicals attributable to the site (EPA, 1997). Assessment endpoints contain an entity (e.g., shrew population) and an attribute of that entity (e.g., survival rate) to be protected. Individual assessment endpoints usually encompass a group of species or populations (the receptor) with some common characteristic, such as specific exposure route or contaminant sensitivity.

Assessment and measurement endpoints may involve ecological components from any level of biological organization, from individual organisms to the ecosystem itself (EPA, 1992). Effects on individuals are important for some receptors, such as rare and endangered species, while population- and community-level effects are typically more relevant to ecosystems and are most often the focus of evaluations. Population- and community-level effects are usually difficult to evaluate directly without long-term and extensive study. However, measurement endpoint evaluations at the individual level, such as an evaluation of the effects of chemical exposure on reproduction, can be used to predict effects on an assessment endpoint at the population or community level. A summary of the assessment and measurement endpoints identified for evaluation in the ERA is summarized in Table 5-1.

Selection of Surrogate Receptors

Because of the complexity of natural systems, it is generally not possible to directly assess the potential impacts to all ecological receptors present within an area. Therefore, specific receptor species (e.g., short-tailed shrew) or species groups (e.g., terrestrial plants) are often selected as surrogates to evaluate potential risks to larger components of the ecological community (guilds; e.g., terrestrial mammalian insectivores) used to represent the assessment endpoints (e.g., survival and reproduction of terrestrial mammalian insectivores). Selection criteria typically include those species that:

- Are known to occur, or are likely to occur, at the site
- Have a particular ecological, economic, or aesthetic value
- Are representative of taxonomic groups, life history traits, and/or trophic levels in the habitats present at the site for which complete exposure pathways are likely to exist
- Can, because of toxicological sensitivity or potential exposure magnitude, be expected to represent potentially sensitive populations at the site

- Have sufficient ecotoxicological information available on which to base an evaluation

Lower trophic level receptor species are evaluated in the SERA based on those taxonomic groupings for which screening values have been developed. These groupings and screening values are used in most ecological risk assessments. As such, specific species of terrestrial plants and soil invertebrates (earthworms are the standard surrogate) are not chosen as receptors because limited species-specific information is available and because terrestrial plants and soil invertebrates are dealt with on a community level via a comparison to soil screening values.

Risk to reptiles also is evaluated using birds as surrogates based on limitations in relevant toxicity data available for these receptors. Using this approach, potential risks indicated to birds should be interpreted as also indicating a potential risk to reptiles.

The following upper trophic level receptor species have been chosen for exposure modeling based on the criteria listed above, the general guidelines presented in EPA (1991), and the relevant assessment endpoints:

- Short-tailed shrew (*Blarina brevicauda*)—terrestrial mammalian insectivore
- Deer mouse (*Peromyscus maniculatus*)—terrestrial mammalian omnivore
- Red fox (*Vulpes vulpes*)—terrestrial mammalian carnivore
- American robin (*Turdus migratorius*)—terrestrial avian insectivore/omnivore
- American woodcock (*Scolopax minor*) - wetland/terrestrial avian insectivore
- Red-tailed hawk (*Buteo jamaicensis*)—terrestrial avian carnivore

A summary of the assessment endpoints, measurement endpoints, risk hypotheses, and surrogate receptors identified for evaluation in the ERA is summarized in Table 5-1.

5.2.2 Screening-Level Effects Evaluation

The purpose of the screening-level effects evaluation is to establish chemical exposure levels (screening values) that represent conservative thresholds for adverse ecological effects. One set of screening values is typically developed for each selected assessment endpoint.

Medium-Specific Screening Values

Medium-specific screening values were established for soil. The screening values used in the SERA represent either Region III Biological Technical Assistance Group (BTAG) screening values (EPA, 1995) or alternate screening values selected from the open scientific literature (CH2M HILL, January 2000). Table 5-2 summarizes these screening values. Where more than one final screening value was available for a chemical within a medium (e.g., one for soil fauna and flora), the lower of the values was selected for use in the SERA.

Ingestion Screening Values

Ingestion screening values for dietary exposures were derived for each avian/mammalian receptor species and bioaccumulating chemical. Toxicological information from the literature for wildlife species most closely related to the receptor species was used, where available, but was supplemented by laboratory studies of non-wildlife species (e.g., laboratory mice) where necessary. The ingestion screening values are expressed as

milligrams of the chemical per kilogram body weight of the receptor per day (mg/kg-BW/day).

Growth and reproduction were emphasized as assessment endpoints since they are the most relevant, ecologically, to maintaining viable populations and because they are generally the most studied chronic toxicological endpoints for ecological receptors. If several chronic toxicity studies were available from the literature, the most appropriate study was selected for each receptor species based on study design, study methodology, study duration, study endpoint, and test species. No Observed Adverse Effect Levels (NOAELs) based on growth and reproduction were utilized, where available, as the screening values. When chronic NOAEL values were unavailable, estimates were derived or extrapolated from chronic Lowest Observed Adverse Effect Levels (LOAELs) or acute values as follows:

- When values for chronic toxicity were not available, the median lethal dose (LD_{50}) was used. An uncertainty factor (UF) of 100 was used to convert the acute LD_{50} to a chronic NOAEL (i.e., the LD_{50} was multiplied by 0.01 to obtain the chronic NOAEL)
- A UF of 10 was used to convert a reported LOAEL to a NOAEL

Ingestion screening values for mammals and birds are summarized in Tables 5-3 and 5-4, respectively.

5.2.3 Screening-Level Exposure Estimate

The available analytical data were evaluated and selected to represent the relevant environmental media at Site 5. Subsequently, maximum concentrations in surface soil and surface water were used in the SERA to conservatively estimate potential chemical exposures (direct and food web exposures) for the ecological receptors selected to represent the assessment endpoints at each site (direct and food web exposures).

Selection Criteria for Analytical Data

Analytical data from the RI and ERI were used to estimate media concentrations in this ERA. These analytical data were selected for use in the SERA according to the following selection criteria:

- Data must have been validated by a qualified data validator using acceptable data validation methods. Rejected (R) values were not used in the SERA. Unqualified data and data qualified as J, L, or K were treated as detected. Data qualified as U or B were treated as non-detected.
- Soil samples collected from depths of 0 to 6 in. bgs were used since this range best represents the depth of exposure for most ecological receptors evaluated in terrestrial habitats.

A summary of the samples selected for use in the SERA is presented in Table 5-5. A summary of the raw data for each of the selected sample locations is presented in Appendix D.

For chemicals not detected in any samples, the maximum reporting limit was used to estimate the exposure concentration. For samples with duplicate analyses, the higher of the two detected concentrations was used in screening if both values were detects while the

higher Default factors of 1.0 were used when data were not available for a chemical in the literature. Incidental ingestion of soil was also included when calculating total exposure. In the models it was assumed that chemicals were 100 percent bioavailable to the receptor and that each receptor spent 100 percent of its time on the site (i.e., an area use factor of 1.0 was assumed).

Additional surface water data were not collected during the ERI. However, surface water on Site 5 may (at least periodically) act as a source of drinking water to wildlife. Accordingly, surface water data collected from Site 5 during earlier phases of the RI were summarized and included in the food web models evaluated as part of this RI.

The methodology and models used to derive tissue concentration estimates are described in the following subsections.

Direct Exposure

The maximum detected chemical concentrations in soil were used in the SERA to conservatively estimate potential direct chemical exposures for the ecological receptors selected for evaluation.

Food Web Exposure

All chemicals identified as potentially bioaccumulative in EPA (2000) were evaluated in food web exposure models for upper trophic level receptors. In these models, exposure is estimated based on the assumption that chemicals can accumulate in the dietary components of receptors. The concentration of each dietary item (i.e., tissue concentrations) was first estimated from the maximum detected concentrations of these chemicals in soils. Dietary exposure was then estimated for each wildlife receptor selected for evaluation in the SERA. These procedures are described in the following subsections.

Tissue Concentrations

Dietary items for which tissue concentrations were modeled included terrestrial plants, soil invertebrates (earthworms), and small mammals. The uptake of chemicals from the abiotic media into these dietary items was based (where available) on conservative (e.g., maximum or 90th percentile) bioconcentration factors (BCFs) or bioaccumulation factors (BAFs) from the literature.

Terrestrial Plant Tissue

Tissue concentrations in the above-ground vegetative portion of terrestrial plants were estimated by multiplying the maximum measured surface soil concentration for each chemical by chemical-specific soil-to-plant BCFs obtained from the scientific literature. The BCF values used were based on root uptake from soil and on the ratio between dry-weight soil and dry-weight plant tissue. Literature values based on the ratio between dry-weight soil and wet-weight plant tissue were converted to a dry-weight basis by dividing the wet-weight BCF by the estimated solids content for terrestrial plants (15 percent [0.15]; Sample et al. 1997).

For metals without literature based BCFs, a soil-to-plant BCF of 1.0 was assumed. For organic chemicals without literature based BCFs, soil-to-plant BCFs were estimated using the algorithm provided in Travis and Arms (1988):

$$\log B_v = 1.588 - (0.578)(\log K_{ow})$$

where: B_v = Soil-to-plant BCF (unitless; dry weight basis)

K_{ow} = Octanol-water partitioning coefficient (unitless)

The log K_{ow} values used in the calculations were obtained mostly from EPA (1995; 1996). The soil-to-plant BCFs used in the SERA are shown in Table 5-6.

Earthworms Tissue

Tissue concentrations in soil invertebrates (earthworms) were estimated by multiplying the maximum measured surface soil concentration for each chemical by chemical-specific BCFs or BAFs obtained from the literature. BCFs are calculated by dividing the concentration of a chemical in the tissues of an organism by the concentration of that same chemical in the surrounding environmental medium (in this case, soil) without accounting for uptake via the diet. BAFs consider both direct exposure to soil and exposure via the diet. Since earthworms consume soil, BAFs are more appropriate values and are used in the food web models when available. BAFs based on depurated analyses (soil was purged from the gut of the earthworm prior to analysis) were given preference over undepurated analyses when selecting BAF values since direct ingestion of soil is accounted for separately in the food web model.

The BCF/BAF values used were based on the ratio between dry-weight soil and dry-weight earthworm tissue. Literature values based on the ratio between dry-weight soil and wet-weight earthworm tissue were converted to a dry-weight basis by dividing the wet-weight BCF/BAF by the estimated solids content for earthworms (16 percent [0.16]; EPA, 1993). For metals without available measured BAFs or BCFs, an earthworm BAF of 1.0 was assumed. The soil-to-invertebrate (earthworm) BCFs/BAFs used in the SERA are shown in Table 5-6.

Small Mammals

Whole-body tissue concentrations in small mammalian prey (shrews, voles, and/or mice) were estimated using one of two methodologies. For chemicals with literature-based soil-to-small mammal BAFs, the small mammal tissue concentration was estimated by multiplying the maximum measured surface soil concentration for each chemical by a chemical-specific soil-to-small mammal BAFs obtained from the literature. The BAF values used were based on the ratio between dry-weight soil and whole-body dry-weight tissue. Literature values based on the ratio between dry-weight soil and wet-weight tissue were converted to a dry-weight basis by dividing the wet-weight BAF by the estimated solids content for small mammals (32 percent [0.32]; EPA, 1993).

BAFs reported in Sample et al. (1998) were used to estimate whole-body tissue concentrations. The small mammal BAFs used in the SERA are shown in Table 5-7. Detection limits were used in screening if both values were non-detects. In cases where one result was a detection and the other a non-detect, the detected value was used in screening. For chemicals without soil-to-small mammal BAF values, an alternate approach was used to estimate whole-body tissue concentrations. Because most chemical exposure for small mammal species is via diet, it was assumed that the concentration of each chemical in the small mammal's tissues was equal to the chemical concentration in its diet, that is, a diet to whole-body BAF (wet-weight basis) of one was assumed. The diet to whole-body BAF value of one is expected to represent a conservative estimate of tissue concentrations for most

chemicals. For example, a maximum BAF (wet weight) value of 1.0 was reported by Simmons and McKee (1992) for polychlorinated biphenyls (PCBs) based on laboratory studies with white-footed mice. Menzie et al. (1992) reported BAF values (wet-weight) for DDT of 0.3 for voles and 0.2 for short-tailed shrews. Reported BAF (wet-weight) values for dioxin were only slightly above one (1.4) for the deer mouse (EPA, 1990). Resulting tissue concentrations (wet-weight) were then converted to dry weight using an estimated solids content of 32 percent (see above).

Dietary Intakes

Dietary intakes for each receptor species were calculated using the following formula (modified from EPA [1993]):

$$DI_x = \frac{[[\sum_i (FIR)(FC_{xi})(PDF_i)] + [(FIR)(SC_x)(PDS)] + [(WIR)(WC_x)]]}{BW}$$

where:

DI_x	=	Dietary intake for chemical x (mg chemical/kg body weight/day)
FIR	=	Food ingestion rate (kg/day, dry-weight)
FC_{xi}	=	Concentration of chemical x in food item i (mg/kg, dry weight)
PDF_i	=	Proportion of diet composed of food item i (dry weight basis)
SC_x	=	Concentration of chemical x in soil (mg/kg, dry weight)
PDS	=	Proportion of diet composed of soil (dry weight basis)
WIR	=	Water ingestion rate (l/day)
WC_x	=	Concentration of chemical x in water (mg/l)
BW	=	Body weight (kg, wet weight)

A summary of the receptor-specific exposure parameters used for the above equation is provided in Table 5-8**.** Exposures were based on maximum ingestion rates and minimum body weights for each receptor.

5.2.4 Screening-Level Risk Calculation

The screening-level risk calculation is the final step in a SERA. In this step, the maximum exposure concentrations (i.e., direct exposure to environmental media) or exposure doses (i.e., ingestion/dietary dosage for upper trophic level receptor species) are compared with the corresponding screening values to derive screening-level risk estimates. The outcome of this step is a list of COPCs for each media-pathway-receptor combination evaluated.

COPCs are selected using the HQ method. The HQs are calculated by dividing the estimated exposure concentration by the corresponding medium-specific screening value (direct exposure) or by dividing the exposure dose by the corresponding ingestion screening value (food web exposure). Chemicals with HQs greater than or equal to 1.0 are considered COPCs in the SERA and are further evaluated in the ERA. When HQs are less than 1.0 the

chemicals are not considered COPCs and are eliminated from further consideration in the ERA. Chemicals without screening values were retained as COPCs in the SERA.

HQs equal to or exceeding 1.0 indicate the potential for risk. However, screening values and exposure estimates are derived using intentionally conservative assumptions such that HQs greater than or equal to 1.0 do not necessarily indicate that risks are present or impacts are occurring. Rather, it identifies chemical-pathway-receptor combinations requiring further evaluation. Following the same reasoning, HQs that are less than 1.0 indicate that risks are very unlikely, enabling a conclusion of no unacceptable risk to be reached with high confidence.

Detected chemicals that did not have screening values and chemicals that were not detected but had maximum reporting limits exceeding screening values were identified as COPCs in the SERA. Chemicals that were not detected and did not have screening values, though identified as COPCs in the SERA, were not further evaluated in Step 3A. Uncertainties associated with these compounds were discussed in the Uncertainty section at the end of Step 3A.

5.2.5 Refinement of Conservative Exposure Assumptions (Step 3A)

COPCs are identified in the SERA (i.e., Steps 1 and 2) using conservative exposure assumptions. If chemicals are shown to have the potential for posing ecological risk (i.e., HQs greater than or equal to 1.0) then they require further evaluation. According to Navy guidance (CNO, 1999), the BERA is initiated in Step 3A. In this step, the conservative exposure assumptions are refined to be more environmentally realistic and the risk estimates are re-calculated using the conceptual models developed in Tier 1. The following sections discuss the refinements to the exposure assumptions and risk calculation conducted as part of Step 3A. Chemicals that were identified as potential risk based on Step 3A risk calculations were identified as COCs.

Exposure Assumption Refinements

The refined exposure assumptions and methods that were modified for the calculation of media-specific and food chain hazard quotients for Step 3A are listed below.

Average concentrations are used instead of maximum concentrations to evaluate potential impacts to terrestrial plants and invertebrates. While immobile invertebrates could be impacted by maximum concentrations, the invertebrate population as a whole will be exposed to a range of chemical concentrations and therefore the average concentration is a more realistic indicator of the overall potential for population- or community-level effect.

Average chemical concentrations are used instead of more conservative maximum concentrations to evaluate potential effects to individual avian and mammal receptors, because the average chemical concentration more accurately estimates exposure to these mobile receptors that are likely to forage over a large area.

Where sufficient data are available, mean BCF or BAFs replace the selected BCF or BAF used in the SERA. The refined soil-to-plant and soil-to-invertebrate BCFs/BAFs and soil-to-small mammal BAFs are summarized in Tables 5-9 and 5-10, respectively.

Midpoints of body weight and ingestion rate were used to develop exposure estimates, rather than minimum body weights and maximum ingestion rates because midpoint exposure parameters are more representative of a greater proportion of a population. The Step 3A refined exposure parameters are summarized in Table 5-11.

Refined Risk Calculations

Following refinement of the exposure assumptions, risks from direct and food web exposure were recalculated using the same HQ method as described in Section 5.2.4. In the SERA, however, chemicals in the food web models were identified as COPCs if the estimated dose to wildlife exceeded the NOAEL for a chemical. The dose that is protective to wildlife, however, is expected to fall between the NOAEL and the LOAEL. Both the NOAEL and LOAEL were used for comparison in Step 3A. However, chemicals were eliminated as COPCs if estimated wildlife exposure doses did not exceed the LOAEL because this dose is expected to be protective of the overall population, which is the assessment endpoint being evaluated.

Chemicals that were not detected but were retained as COPCs in the SERA because the maximum reporting limit exceeded the respective screening value were further evaluated in Step 3A by comparing the mean reporting limit to the screening value. Chemicals (nondetected) having mean reporting limits that exceeded screening values were discussed in the Uncertainty Section at the end of Step 3A. Finally, chemicals that were detected but did not have screening values were retained as COCs.

5.3 Chemical Concentrations and Risk Calculations (Steps 2 and 3A)

The following section summarizes chemical concentrations detected in Site 5 surface soils. This section also presents the results of the SERA and BERA (Step 3A) risk calculations.

5.3.1 Summary of Chemical Concentrations

Summaries of chemical concentrations detected in Site 5 surface soil and surface water are presented in Tables 5-12 and 5-13, respectively. These tables include a summary of the reporting limit range, frequency of detection, maximum concentration detected, identification of sample with the maximum detected concentration, arithmetic mean and standard deviation of the mean. As discussed in Section 5.2.3.1, no additional surface water data were collected as part of the ERI. However, surface water on Site 5 may (at least periodically) act as a source of drinking water to wildlife. Accordingly, surface water data collected from Site 5 during earlier phases of the RI were summarized and included in the food web models evaluated.

5.3.2 Screening-Level Risk Calculations

The following sections summarize the outcome of the screening-level risk calculation. COPCs were identified for receptors via both direct and food web exposure and all receptors were consequently considered further in the Step 3A risk calculations. It should be noted, a number of the organic chemicals identified as COPCs were not detected but had

maximum detection limits exceeding screening values, or were detected, but did not have medium-specific screening values.

Direct Exposure

The SERA (Step 2) indicated the potential for inorganic and organic chemicals in surface soil to adversely affect ecological receptors at Site 5 as a result of direct exposure. A summary of these COPCs is presented in Table 5-14.

Food Web

Metals, pesticides/PCB mixtures, dioxins and furans, and other semivolatile organic compounds (SVOCs) were identified as COPCs for several higher trophic level avian and mammalian receptors. A summary of these COPCs is presented in Table 5-15.

5.3.3 Refined Risk Calculations (Step 3A)

Direct Exposure to Chemicals in Soil

The mean concentrations of 15 metals, the pesticide compounds 4,4'-DDE and 4,4'-DDT, 13 PAHs, and n-nitrosodiphenylamine exceeded soil-screening levels in Step 3A. A summary of these chemicals is presented in Table 5-16.

Two pesticides (endosulfan sulfate, gamma-chlordane), six SVOCs (2,4-dinitrotoluene, 2,6-dinitrotoluene, 2-methylnapthelene, 4-nitroaniline, carbazole and bis[2-ethylhexyl]phthalate), two explosive compounds (2,4-dinitrotoluene and 2-amino-4,6-dinitrotoluene), four VOCs (1,2-dichloroethene, 2-butanone, acetone, and chloromethane), and all analyzed dioxins and furans were identified as COPCs in soil since they were detected but did not have screening values.

Food Web

Results of the revised food web exposure models, which evaluate risk based on comparison of the revised exposure concentrations to the LOAEL, suggest that arsenic, copper, lead, selenium, and zinc could pose a risk to insectivorous mammals (represented by short-tailed shrew), lead and zinc could pose a risk to omnivorous mammals (represented by deer mouse), copper and zinc could pose a risk to carnivorous mammals (represented by red fox), copper, lead, and zinc could pose a risk to omnivorous birds (represented by American robin) and insectivorous birds (represented by American woodcock), and lead could pose a risk to carnivorous birds (represented by red-tailed hawk) (Table 5-17).

5.3.4 Summary of COPCs

Summaries of the COPCs resulting for direct exposure and food chain risk calculations at the completion of Step 3A are presented in Table 5-18.

5.3.5 Uncertainties

Due to the need to make assumptions and extrapolations when estimating risk, there are uncertainties associated with risks estimated in this ERA. Because, however, conservative assumptions were used throughout the ERA, particularly in the SERA (Steps 1 and 2), these

assumptions are likely to result in the overestimation of potential risk. A brief summary of the key uncertainties in this ERA are summarized in this section.

- Detection Limits—Although some chemicals were not detected in site media, they were identified as COPCs because the instrument detection limit for that chemical exceeded applicable screening values (i.e., the maximum detection limit for the SERA, and half the mean detection limit for the BERA, Step 3A). The potential for risks associated with these chemicals cannot be fully evaluated and represents an uncertainty in the risk assessment.

  One notable group of chemicals associated with this uncertainty in this risk assessment are SVOCs. As shown in Table 5-16, detection limits exceeded ecological screening values for a total of 16 SVOCs. These elevated detection limits not only result in a less accurate estimate of chemical concentration (as a result of censoring), but can also upwardly bias concentration (and risk) estimates when using a summary statistics (e.g., mean) for the calculation of risk.

- Chemicals Without Screening Values—A number of detected organic chemicals in surface soil did not have ecological screening values. In the Step 3 evaluation, 2 pesticides, 6 SVOCs, 2 explosives, 4 VOCs, and all dioxins and furans did not have screening values. There is substantial uncertainty associated with these compounds and overall risks to terrestrial plants/soil invertebrates based on the absence of these screening values.

  There is uncertainty associated with the potential for the detection limits of non-detected chemicals without screening values to exceed ecological screening values. However, based on the large number of samples collected from soils, it is considered unlikely that chemicals potentially posing a risk to ecological receptors would not have been detected within this media.

- Soil Sampling Depth—Chemical concentrations were evaluated in soil samples collected from a depth of 0 to 6 in. because this best represents the depth at which most ecological receptors would be exposed to chemicals in soil. However, some potential receptors could be exposed to chemicals at greater depth if they burrow to subsurface soils. There is some potential for risks to have been underestimated to burrowing organisms if chemical concentrations are greater in subsurface soil.

- Ingestion Screening Values—Toxicity data for many of the COPCs and surrogate receptor species were minimal, requiring the extrapolation of data from similar wildlife species or from laboratory studies with non-wildlife species (e.g., rats, mice, chicken, dog, etc.). The extrapolation of toxic effects in one species to those in another is characterized by a UF that is often the product of several others. Thus a benchmark value may be less than the concentration used in the actual literature studies. The uncertainties associated with toxicity extrapolation were minimized through the selection of the most appropriate test species for which suitable toxicity data were available. The factors considered in selecting a test species to represent a receptor species included taxonomic similarities, trophic level, foraging method, and similarity of diet.

  Secondly, there are situations in which LOAEL or LD_{50} values are the only toxicity endpoints available from the literature. In these situations, UFs are applied for

extrapolating/converting these values into NOAEL value. Extrapolating in such a manner may either over estimate or under estimate toxicity.

Finally, another form of uncertainty relates to the derivation of ingestion screening values applied to metals. Most of the toxicological studies on which the ingestion screening values for metals were based used soluble forms (such as salts) which exhibit higher bioavailability to receptors. Since the analytical samples on which site-specific exposure estimates were based measured total concentration, regardless of form, and these highly bioavailable forms are expected to compose only a fraction of the total concentration, this is likely to result in an overestimation of potential risks for these chemicals.

- Chemical Mixtures—Information on the ecotoxicological effects of chemical interactions is minimal, which required (as is standard for ecological risk assessments) that the chemicals be evaluated on a compound-by-compound basis during the comparison to screening value. This could result in an underestimation of risk (if there are additive or synergistic effects among chemicals) or an overestimation of risks (if there are antagonistic effects among chemicals).

- Surrogate Receptor Selection and Use—Specific receptor species (e.g., red-tailed hawk) or species groups (e.g., terrestrial plants) were selected using criteria thought to best represent the ecological communities at these sites and to evaluate potential risks to larger ecological components (i.e., feeding guilds, such as terrestrial avian carnivores). Even though as many site-specific factors as possible are incorporated, not all existing species or habitat conditions can be considered. This represents an uncertainty in the risk assessment.

  Several species of reptiles have been observed on SJCA land, and are expected to occur on Site 5. Since the toxicity data are not very well developed for these wildlife groups, other vertebrate receptors with similar diets and habitat requirements were used for these sites to represent the broader ecological community.

- Food Web Exposure Modeling—Chemical concentrations in terrestrial food items (plants, earthworms, and small mammals) were modeled from measured media concentrations and were not directly measured. Use of the literature-derived exposure models and BAFs introduces some uncertainty into the resulting tissue concentration estimates. For example, it was conservatively assumed chemicals were bioavailable in the environment. Factors affecting bioavailability of contaminants for uptake by plants and invertebrates were not evaluated in the SERA or BERA. Therefore calculated exposure doses may be overestimated. The values selected and methodology employed were intended to provide a conservative (SERA) or reasonable (Step 3A) estimate of potential food web exposure concentrations.

  Another source of uncertainty is the use of default assumptions for exposure parameters such as BCFs/BAFs. Although BCFs or BAFs for many bioaccumulative chemicals were readily available from the literature and were used in the ERA, the use of a default factor of 1.0 to estimate the concentration of some chemicals in prey items is a source of uncertainty and, in most cases, has the potential to overestimate risk.

- Estimating Exposure Concentration – The Step 3a exposure assumption refinements used average instead of maximum concentrations to estimate exposure concentrations for lower trophic-level species (terrestrial plants and soil invertebrates) and wildlife. This is because, as discussed in Section 5.3.3, average concentrations are expected to provide more accurate estimates of potential impact to overall populations of lower trophic-level species and to mobile higher trophic-level wildlife. However, as a single integrative measure, the mean concentration, can mask spatial trends in chemical concentration. Trends in chemical concentration and the range/distribution of chemicals at the site will affect the overall potential for adverse effect and must therefore be considered when evaluating risks. For lower trophic-level species, the variability in chemical concentration will determine the magnitude and pattern of localized effects. For example, greater variability in chemical concentration will result in a heterogeous level of risk throughout the site, while a more even distribution of chemicals will result in a more consistent level of risk throughout the site area. Most wildlife for which risks were modeled have a habitat range which is smaller than the site. The use of a mean concentration, which integrates all data from Site 5, may over or underestimate potential risk if the chemical concentration varies substantially over the site and if the receptor is only exposed to a portion of the site. The trends in chemical concentration and the influence of those trends on potential risks are therefore considered as part of the Problem Formulation Revision (Step 3B) of the ERA.

5.4 Problem Formulation Revision (Step 3B)

5.4.1 Detailed Evaluation of Step 3A COPCs

The following section further evaluates chemicals identified as COCs at the conclusion of Step 3A (Table 5-18) by comparing site-related COC concentrations to available background (non site-impacted) concentrations and characterizing the spatial distribution of site-related COCs.

Comparison of Site Soil to Background Concentrations

Previous evaluations of potential risk within this ERA did not account for the non site-related concentrations of chemicals in the environment (e.g., naturally occurring and/or anthropogenic sources unrelated to previous site activities). However, some metals occurring at concentrations above screening values for direct exposure comparisons, or indicating potential risk via the food web models, might reflect non site-related concentrations or naturally-occurring concentrations. If metals are present at naturally occurring concentrations, and the risk models indicate a potential risk, it is reasonable to assume that risks due to site-related impacts were overestimated by the methods employed. The overestimation of potential risk might reflect either naturally elevated regional concentrations, in which case ecological communities would be expected to have adapted to these levels, or the conservative exposure or toxicity assumptions made in the ERA.

In addition to chemicals occurring within background concentrations, some chemicals present in soil may, at least in part, have originated from sources not related to the sites evaluated in this ERA. This is particularly relevant to organic chemicals such as PAHs, which are ubiquitous in the environment (Eisler, 1987). Pesticides, meanwhile, were used

throughout the facility and are their presence in surface soil is likely to represent historic application at the facility and not site-specific activities. Accordingly, PAH and pesticide concentrations detected in site surface soils were also compared to those detected in background to help identify if these chemicals are likely to be site-related (Appendix C, Table C-1).

Spatial Trend Evaluation of Select COCs

The following section presents a spatial trends analysis for select surface soil COCs. An understanding of the distribution of these COCs is necessary when evaluating the area and magnitude of potential ecological risk, the potential movement of COCs to offsite areas (e.g., transport via site-related drainages), and the focus and/or need for further site investigation or action.

Hazard quotients were plotted for a selected/representative group of chemicals to evaluate the general distribution of chemicals (and resulting risks) in Site 5 surface soils. Emphasis was placed on further evaluating chemicals that were identified as COCs based on direct (terrestrial plants/soil invertebrates) or food web (wildlife) exposure scenarios.

Eight metals (arsenic, chromium, copper, lead, mercury, nickel, vanadium, and zinc), total PAHs, and total DDT concentrations were identified for spatial analysis based on these guidelines. Total PAH concentrations were calculated by summing the sample-specific concentrations of 17 individual PAH compounds. Total DDT concentrations were similarly calculated by summing the sample-specific concentrations of 4,4'-DDT, and its breakdown products 4,4'-DDD and 4,4'-DDE.

For the spatial analysis, HQs were calculated based on the chemical concentrations detected at each sample location. Chemical concentrations exceeding their screening values were depicted by color coding in the figures, with different colors representing different levels of HQ exceedance. Screening values used for the calculation of the HQs were based on screening values presented in either EPA Region III BTAG (1995) or Efroymson et al. (1997a, 1997b). Screening values for total PAH and total DDT concentrations were based on screening values presented in MHSPE (1994).

Metals. There is no clear spatial pattern of metal concentration distribution in surface soil (Figures 5-1 through 5-8). Elevated metal concentrations appear isolated (chromium, lead, and zinc). Further, although the maximum detected concentrations of most of the metals detected in surface soils exceed those detected in background, the onsite concentrations of many metals did not significantly exceed background (Table 3-1). The absence of a clear pattern of chemical distribution for most metals is consistent with the statistical analytical results, which suggests that, although isolated concentrations of many metals exceed background UTLs, there is not a pattern or trend of exceedance.

The localized areas of higher concentrations of these metals suggest that the potential risk to both lower trophic-level receptors and wildlife will not be consistent across the site. Although a mean concentration was used for the estimation of risk in the Site 5 area, it should be recognized that the distribution of metals onsite is relatively patchy, and this will result in a varied level of risk to receptors. For terrestrial plants and soil invertebrates, for example, this is likely to result in localized areas having very different potentials for adverse effect. Furthermore, with the exception of the red tailed hawk (representative of carnivorous

birds), the wildlife species evaluated for the ERA have home ranges that are less than the size of Site 5. Risks for these species will therefore depend on the location where these species occur on the site.

PAHs. The spatial distribution of total PAHs is presented on Figure 5-9. The PAH plot indicates the widespread distribution of PAHs in surface soil and does not indicate localized areas of high concentrations. This widespread pattern of PAH distribution in surface soil is consistent with results of the statistical analysis, which indicates that many PAH concentrations do not significantly exceed those detected in background (Table 3-1). The widespread and relatively homogenous distribution of PAHs suggests that any risks associated with these chemicals are likely to be similar throughout the site. Furthermore, many of the PAHs were detected at concentrations that do not exceed those detected in background, suggesting that the presence of PAHs in surface soil do not result solely from site-related activities.

Total DDT. The spatial distribution of total DDT concentrations (comprised of DDT, DDD, and DDE) is presented on Figure 5-10. The plot of total DDT concentrations indicates the widespread distribution of DDT compounds in surface soil. Furthermore, DDT compounds were detected in most surface soil samples (Table 5-12) at concentrations statistically higher than background. Pesticides were used throughout the facility and are their presence in surface soil throughout much of Site 5 is likely to represent historic application and not site-specific activities. There remains some uncertainty, however, in some isolated locations where high DDT compound concentrations were detected. These sample locations include SS35 where DDE concentrations of 4,700 µg /kg and DDT concentrations of 3,100 µg /kg were detected, and at some sample locations (SS09, SS32, SS56, and SS59) where DDT concentrations in excess of 1,000 µg/kg were detected. Many of these locations are adjacent to or within wooded areas, where very little or no disturbance has occurred, and there is uncertainty associated with the origin of the higher DDT compound concentrations that were detected at these locations.

5.4.2 Risk Summary and Conclusions

The ERA indicates the potential for adverse effects to lower trophic-level receptors (plants and soil invertebrates) from the presence of chemicals (primarily metals, PAHs, and DDT compounds) in Site 5 surface soil. The ERA also indicates the potential for adverse effects to one or more avian and/or mammalian wildlife receptors from the presence of arsenic, copper, lead, selenium, and/or zinc in Site 5 surface soils.

It should be noted, however, that PAHs did not occur at concentrations statistically exceeding those detected in background and, with the exception of some localized areas of higher concentration, the widespread presence of DDT compounds throughout much of Site 5 is likely to reflect the historic application at the facility and do not result from historic site-related activities.

5.4.3 Conceptual Model Revision

In this section, the screening problem formulation is typically revised and focused to better define the key chemical-pathway-receptor combinations identified in both the Step 3A evaluation and the additional evaluations presented in the preceding section. As discussed

in preceding sections, historic site activities have resulted in the presence of chemicals in Site 5 surface soils at concentrations that could represent a potential risk to terrestrial wildlife.

Based on conclusions drawn from the refined risk assessment models, with consideration of the background comparison, the assessment endpoints chosen for Site 5 are as follows:

- *Terrestrial plant and soil invertebrate community survival and growth* – Terrestrial plants and soil invertebrates serve as a prey base for many terrestrial species. The vegetated areas of Site 5 will support fewer terrestrial birds and mammals if chemical concentrations in soil are limiting the survival and growth of terrestrial plants and soil invertebrates.
- *Insectivorous mammal population survival and reproduction* – These receptors are susceptible to chemicals that have the potential to bioaccumulate into soil invertebrates. These chemicals could reduce the survival and reproduction of terrestrial mammalian insectivores and adversely affect the viability of these populations.

Based on the results of the ERA, no additional ecological investigation is recommended. The removal action recommended in the EE/CA for Site 5 Waste/Burnt Soil Area will address the potential ecological risk within the Waste/Burnt Soil Area. Additionally, a Feasibility Study is recommended to evaluate remedial alternatives to address potential ecological risks in the surface soil over the remainder of the site and the sediment in the drainage ditches.

Table 5-1
Preliminary Assessment Endpoints, Risk Hypotheses, Measurement Endpoints, and Receptors
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Assessment Endpoints	Risk Hypothesis	Measurement Endpoint	Receptor Species
Protection of terrestrial plant communities from the toxic effects (on survival and growth) of site-related chemicals present in surface soil	Determine if levels of site-related chemicals are present in surface soils sufficient to cause adverse effects on the survival and growth of terrestrial plants at the site.	Comparison of exposure HQs to a reference HQ of 1.0. Exposure HQs are calculated for individual chemicals by dividing the soil concentrations by a terrestrial plant-based soil screening values. A reference HQ of 1.0 represents a condition where the soil concentration is equal to the screening values.	Terrestrial Plants
Protection of soil invertebrate communities from the toxic effects (on survival and growth) of site-related chemicals present in surface soil	Determine if levels of site-related chemicals present in surface soils are sufficient to cause adverse effects on the survival and growth of soil invertebrates at the site.	Comparison of exposure HQs to a reference HQ of 1.0. Exposure HQs are calculated for individual chemicals by dividing the soil concentrations by an invertebrate-based soil screening values. A reference HQ of 1.0 represents a condition where the soil concentration is equal to the screening values.	Soil invertebrates
Protection of insectivorous mammals to ensure that ingestion of contaminants in soil and prey does not have a negative impact on growth, survival, and reproduction	Determine if levels of site contaminants in soils are sufficient to cause adverse effects on the growth, survival, and reproductive success of insectivorous mammals using the site.	Comparison of dietary HQs to a reference of 1.0. Dietary HQs are calculated for individual chemicals by dividing an estimated level of exposure by an ecotoxicity value that is associated with a NOAEL. A reference HQ of 1.0 represents a dietary dose that is equal to the NOAEL ecotoxicity value.	Short-tailed shrew
Protection of omnivorous mammals to ensure that ingestion of contaminants in soil, prey, and forage does not have negative impacts on growth, survival, and reproduction	Determine if levels of site contaminants in soils are sufficient to cause adverse effects on the growth, survival, and reproductive success of omnivorous mammals using the site?	Comparison of dietary HQs to a reference of 1.0. Dietary HQs are calculated for individual chemicals by dividing an estimated level of exposure by an ecotoxicity value that is associated with a NOAEL. A reference HQ of 1.0 represents a dietary dose that is equal to the NOAEL ecotoxicity value.	Deer mouse
Protection of omnivorous birds to ensure that ingestion of contaminants in soil, prey, and forage does not have negative impacts on growth, survival, and reproduction	Determine if levels of site contaminants in soils are sufficient to cause adverse effects on the growth, survival, and reproductive success of omnivorous birds using the site.	Comparison of dietary HQs to a reference of 1.0. Dietary HQs are calculated for individual chemicals by dividing an estimated level of exposure by an ecotoxicity value that is associated with a NOAEL. A reference HQ of 1.0 represents a dietary dose that is equal to the NOAEL ecotoxicity value.	American robin

Table 5-1
Preliminary Assessment Endpoints, Risk Hypotheses, Measurement Endpoints, and Receptors
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Protection of wetland/terrestrial insectivorous birds to ensure that ingestion of contaminants in soil and prey does not have a negative impact on growth, survival, and reproduction	Determine if levels of site contaminants in soils are sufficient to cause adverse effects on the growth, survival, and reproductive success of wetland/terrestrial insectivorous birds using the site.	Comparison of dietary HQs to a reference of 1.0. Dietary HQs are calculated for individual chemicals by dividing an estimated level of exposure by an ecotoxicity value that is associated with a NOAEL. A reference HQ of 1.0 represents a dietary dose that is equal to the NOAEL ecotoxicity value.	American woodcock
Protection of carnivorous birds to ensure that ingestion of contaminants in soil and prey does not have a negative impact on growth, survival, and reproduction	Determine if levels of site contaminants in soils are sufficient to cause adverse effects on the growth, survival, and reproductive success of carnivorous birds using the site.	Comparison of dietary HQs to a reference of 1.0. Dietary HQs are calculated for individual chemicals by dividing an estimated level of exposure by an ecotoxicity value that is associated with a NOAEL. A reference HQ of 1.0 represents a dietary dose that is equal to the NOAEL ecotoxicity value.	Red-tailed hawk
Protection of carnivorous mammals to ensure that ingestion of contaminants in soil and prey does not have a negative impact on growth, survival, and reproduction	Determine if levels of site contaminants in soils are sufficient to cause adverse effects on the growth, survival, and reproductive success of carnivorous mammals using the site.	Comparison of dietary HQs to a reference of 1.0. Dietary HQs are calculated for individual chemicals by dividing an estimated level of exposure by an ecotoxicity value that is associated with a NOAEL. A reference HQ of 1.0 represents a dietary dose that is equal to the NOAEL ecotoxicity value.	Red fox

Table 5-2
Medium-Specific Screening Values for Surface Soil
Site 5, St. Juliens Creek, Chesapeake, Virginia

Chemical	Screening Value	Units	Reference
1,1,1-Trichloroethane	300	ug/kg	USEPA 1995
1,1,2,2-Tetrachloroethane	300	ug/kg	USEPA 1995
1,1,2-Trichloroethane	300	ug/kg	USEPA 1995
1,1-Dichloroethane	300	ug/kg	USEPA 1995
1,2,4-Trichlorobenzene	1,270	ug/kg	Efroymson et al. 1997b
1,2-Dichlorobenzene	100	ug/kg	USEPA 1995
1,2-Dichloroethane	401	ug/kg	USEPA Region IV 1999
1,2-Dichloroethene (total)	300	ug/kg	USEPA 1995
1,2-Dichloropropane	38,800	ug/kg	Efroymson et al. 1997b
1,4-Dichlorobenzene	1,280	ug/kg	Efroymson et al. 1997b
2,4,5-Trichlorophenol	430	ug/kg	Efroymson et al. 1997a
2,4,6-Trichlorophenol	580	ug/kg	Efroymson et al. 1997b
2,4-Dichlorophenol	13,400	ug/kg	Efroymson et al. 1997b
2,4-Dimethylphenol	100	ug/kg	USEPA 1995
2,4-Dinitrophenol	20,000	ug/kg	Efroymson et al. 1997a
2-Chloronaphthalene	1,033	ug/kg	USEPA Region IV 1999
2-Chlorophenol	100	ug/kg	USEPA 1995
2-Methylphenol	100	ug/kg	USEPA 1995
4,4'-DDD	100	ug/kg	USEPA 1995
4,4'-DDE	100	ug/kg	USEPA 1995
4,4'-DDT	100	ug/kg	USEPA 1995
4-Methyl-2-pentanone	10,000	ug/kg	derived from USEPA 1995
4-Methylphenol	100	ug/kg	USEPA 1995
4-Nitrophenol	380	ug/kg	Efroymson et al. 1997b
Acenaphthene	2,500	ug/kg	Efroymson et al. 1997a
Acenaphthylene	100	ug/kg	USEPA 1995
Aldrin	100	ug/kg	USEPA 1995
alpha-BHC	100,000	ug/kg	USEPA 1995
alpha-Chlordane	100	ug/kg	USEPA 1995
Aluminum	50.0	mg/kg	Efroymson et al. 1997a
Anthracene	100	ug/kg	USEPA 1995
Antimony	5.00	mg/kg	Efroymson et al. 1997a
Aroclor-1016	100	ug/kg	USEPA 1995
Aroclor-1221	100	ug/kg	USEPA 1995
Aroclor-1232	100	ug/kg	USEPA 1995
Aroclor-1242	100	ug/kg	USEPA 1995
Aroclor-1248	100	ug/kg	USEPA 1995
Aroclor-1254	100	ug/kg	USEPA 1995
Aroclor-1260	100	ug/kg	USEPA 1995
Arsenic	60.0	mg/kg	Efroymson et al. 1997b
Barium	500	mg/kg	Efroymson et al. 1997a
Benzene	105	ug/kg	USEPA 1995
Benzo(a)anthracene	100	ug/kg	USEPA 1995
Benzo(a)pyrene	100	ug/kg	USEPA 1995
Benzo(b)fluoranthene	100	ug/kg	USEPA 1995
Benzo(g,h,i)perylene	100	ug/kg	USEPA 1995
Benzo(k)fluoranthene	100	ug/kg	USEPA 1995

Table 5-2
Medium-Specific Screening Values for Surface Soil
Site 5, St. Juliens Creek, Chesapeake, Virginia

Beryllium	10.0	mg/kg	Efroymson et al. 1997a
beta-BHC	100,000	ug/kg	USEPA 1995
Bromodichloromethane	45,000	ug/kg	derived from USEPA 1995
Bromoform	114,700	ug/kg	derived from USEPA 1995
Cadmium	4.00	mg/kg	Efroymson et al. 1997a
Carbon tetrachloride	1,000,000	ug/kg	derived from USEPA 1995
Chlorobenzene	2,400	ug/kg	Efroymson et al. 1997b
Chloroform	1,000	ug/kg	derived from USEPA 1995
Chromium	0.40	mg/kg	Efroymson et al. 1997b
Chrysene	100	ug/kg	USEPA 1995
cis-1,3-Dichloropropene	300	ug/kg	USEPA 1995
Cobalt	100	mg/kg	USEPA 1995
Copper	50.0	mg/kg	Efroymson et al. 1997b
Cyanide	0.060	mg/kg	Eisler 1991
delta-BHC	100,000	ug/kg	USEPA 1995
Dibenz(a,h)anthracene	100	ug/kg	USEPA 1995
Dieldrin	100	ug/kg	USEPA 1995
Diethylphthalate	13,400	ug/kg	Efroymson et al. 1997a
Dimethyl phthalate	10,640	ug/kg	Efroymson et al. 1997b
Di-n-butylphthalate	200,000	ug/kg	Efroymson et al. 1997a
Endrin	100	ug/kg	USEPA 1995
Endrin aldehyde	100	ug/kg	USEPA 1995
Endrin ketone	100	ug/kg	derived from USEPA 1995
Ethylbenzene	5,005	ug/kg	derived from USEPA 1995
Fluoranthene	100	ug/kg	USEPA 1995
Fluorene	1,700	ug/kg	Efroymson et al. 1997b
gamma-BHC (Lindane)	100	ug/kg	USEPA 1995
gamma-Chlordane	100	ug/kg	USEPA 1995
Heptachlor epoxide	100	ug/kg	USEPA 1995
Hexachlorocyclopentadiene	1,000	ug/kg	Efroymson et al. 1997a
Indeno(1,2,3-cd)pyrene	100	ug/kg	USEPA 1995
Iron	200	mg/kg	Efroymson et al. 1997b
Lead	50.0	mg/kg	Efroymson et al. 1997a
Magnesium	4,400	mg/kg	USEPA 1995
Manganese	330	mg/kg	USEPA 1995
Mercury	0.10	mg/kg	Efroymson et al. 1997b
Methoxychlor	100	ug/kg	USEPA 1995
Methylene chloride	1,001	ug/kg	derived from USEPA 1995
Naphthalene	100	ug/kg	USEPA 1995
Nickel	30.0	mg/kg	Efroymson et al. 1997a
Nitrobenzene	2,260	ug/kg	Efroymson et al. 1997b
n-Nitrosodiphenylamine	1,090	ug/kg	Efroymson et al. 1997b
Pentachlorophenol	3,000	ug/kg	Efroymson et al. 1997a
Phenanthrene	100	ug/kg	USEPA 1995
Phenol	1,880	ug/kg	Efroymson et al. 1997b
Pyrene	100	ug/kg	USEPA 1995
Selenium	1.80	mg/kg	USEPA 1995
Silver	2.00	mg/kg	Efroymson et al. 1997a
Styrene	10,010	ug/kg	derived from USEPA 1995

Table 5-2
Medium-Specific Screening Values for Surface Soil
Site 5, St. Juliens Creek, Chesapeake, Virginia

Tetrachloroethene	401	ug/kg	derived from USEPA 1995
Thallium	1.00	mg/kg	Efroymson et al. 1997a
Toluene	13,005	ug/kg	derived from USEPA 1995
trans-1,3-Dichloropropene	300	ug/kg	USEPA 1995
Trichloroethene	6,000	ug/kg	derived from USEPA 1995
Vanadium	2.00	mg/kg	Efroymson et al. 1997a
Vinyl chloride	300	ug/kg	USEPA 1995
Xylene, total	2,505	ug/kg	derived from USEPA 1995
Zinc	50.0	mg/kg	Efroymson et al. 1997a

Table 5-3
Ingestion Screening Values for Mammals
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference
Inorganics								
Arsenic	mouse	0.03	3 generations	oral in water	reproduction	1.26	0.25	Sample et al. 1996
Arsenic	dog	10.0	2 years	oral in diet	systemic	6.00	1.20	ATSDR 1993a
Cadmium	rat	0.303	6 weeks	oral (gavage)	reproduction	10.0	1.00	Sample et al. 1996
Cadmium	dog	10.0	3 months	oral in diet	reproduction	3.75	0.75	ATSDR 1999a
Chromium	rat	0.35	3 months	oral in water	mortality	131	26.3	Sample et al. 1996
Chromium	rat	0.35	1 year	oral in water	body weight/intake	16.4	3.28	Sample et al. 1996
Copper	mouse	0.03	1 month + GD 0-19	oral in diet	developmental	104	78.0	ATSDR 1990a
Copper	mink	1.00	357 days	oral in diet	reproduction	15.1	11.7	Sample et al. 1996
Lead	rat	0.35	3 generations	oral in diet	reproduction	80.0	8.00	Sample et al. 1996
Mercury	rat	0.35	3 generations	oral in diet	reproduction	0.16	0.032	Sample et al. 1996
Mercury	mink	1.00	93 days	oral in diet	survival/weight loss	0.25	0.15	Sample et al. 1996
Nickel	rat	0.35	3 generations	oral in diet	reproduction	80.0	40.0	Sample et al. 1996
Nickel	dog	10.0	2 years	oral in diet	systemic	62.5	25.0	ATSDR 1997a
Selenium	rat	0.35	1 year	oral in water	reproduction	0.33	0.20	Sample et al. 1996
Silver	rat	0.35	2 weeks	oral in water	survival	45.3	9.06	ATSDR 1990b
Zinc	rat	0.35	GD 1-16	oral in diet	reproduction	320	160	Sample et al. 1996
Zinc	mink	1.00	25 weeks	oral	reproduction	104	20.8	ATSDR 1994a
Pesticides/PCBs								
4,4'-DDD	rat	0.35	2 years	oral in diet	reproduction	4.00	0.80	Sample et al. 1996
4,4'-DDD	dog	10.0	2 generations	oral in diet	reproduction	5.00	1.00	ATSDR 1994b
4,4'-DDE	rat	0.35	2 years	oral in diet	reproduction	4.00	0.80	Sample et al. 1996
4,4'-DDE	dog	10.0	2 generations	oral in diet	reproduction	5.00	1.00	ATSDR 1994b
4,4'-DDT	rat	0.35	2 years	oral in diet	reproduction	4.00	0.80	Sample et al. 1996
4,4'-DDT	dog	10.0	2 generations	oral in diet	reproduction	5.00	1.00	ATSDR 1994b
Aldrin	rat	0.35	3 generations	oral in diet	reproduction	1.00	0.20	Sample et al. 1996
alpha-BHC	rat	0.35	4 generations	oral in diet	reproduction	3.20	1.60	Sample et al. 1996
alpha-Chlordane	mouse	0.03	6 generations	oral in diet	reproduction	9.16	4.58	Sample et al. 1996
Aroclor-1016	oldfield mouse	0.014	12 months	oral in diet	reproduction	0.68	0.14	Sample et al. 1996
Aroclor-1016	mink	1.00	18 months	oral in diet	reproduction	3.43	1.37	Sample et al. 1996
Aroclor-1221	oldfield mouse	0.014	12 months	oral in diet	reproduction	0.68	0.14	Sample et al. 1996
Aroclor-1221	mink	1.00	7 months	oral in diet	reproduction	0.69	0.14	Sample et al. 1996

Table 5-3
Ingestion Screening Values for Mammals
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference
Aroclor-1232	oldfield mouse	0.014	12 months	oral in diet	reproduction	0.68	0.14	Sample et al. 1996
Aroclor-1232	mink	1.00	7 months	oral in diet	reproduction	0.69	0.14	Sample et al. 1996
Aroclor-1242	oldfield mouse	0.014	12 months	oral in diet	reproduction	0.68	0.14	Sample et al. 1996
Aroclor-1242	mink	1.00	7 months	oral in diet	reproduction	0.69	0.14	Sample et al. 1996
Aroclor-1248	oldfield mouse	0.014	12 months	oral in diet	reproduction	0.68	0.14	Sample et al. 1996
Aroclor-1248	mink	1.00	4.5 months	oral in diet	reproduction	0.69	0.14	Sample et al. 1996
Aroclor-1254	oldfield mouse	0.014	12 months	oral in diet	reproduction	0.68	0.14	Sample et al. 1996
Aroclor-1254	mink	1.00	4.5 months	oral in diet	reproduction	0.69	0.14	Sample et al. 1996
Aroclor-1260	oldfield mouse	0.014	12 months	oral in diet	reproduction	0.68	0.14	Sample et al. 1996
Aroclor-1260	mink	1.00	4.5 months	oral in diet	reproduction	0.69	0.14	Sample et al. 1996
PCBs (total)	oldfield mouse	0.014	12 months	oral in diet	reproduction	0.68	0.14	Sample et al. 1996
PCBs (total)	mink	1.00	4.5 months	oral in diet	reproduction	0.69	0.14	Sample et al. 1996
beta-BHC	rat	0.35	4 generations	oral in diet	reproduction	3.20	1.60	Sample et al. 1996
delta-BHC	rat	0.35	4 generations	oral in diet	reproduction	3.20	1.60	Sample et al. 1996
Dieldrin	rat	0.35	3 generations	oral in diet	reproduction	0.20	0.04	Sample et al. 1996
Dieldrin	dog	10	15.7 months	oral in diet	systemic	0.14	0.03	ATSDR 1993b
Endosulfan I	rat	0.35	30 days	oral (gavage)	fertility	7.50	1.50	Sample et al. 1996
Endosulfan I	dog	10.0	2 years	oral in diet	systemic	5.00	1.00	ATSDR 1993c
Endosulfan II	rat	0.35	30 days	oral (gavage)	fertility	7.50	1.50	Sample et al. 1996
Endosulfan II	dog	10.0	2 years	oral in diet	systemic	5.00	1.00	ATSDR 1993c
Endrin	mouse	0.03	120 days	oral in diet	reproduction	0.92	0.18	Sample et al. 1996
gamma-BHC (Lindane)	rat	0.35	3 generations	oral in diet	reproduction	40.0	8.00	Sample et al. 1996
gamma-Chlordane	mouse	0.03	6 generations	oral in diet	reproduction	9.16	4.58	Sample et al. 1996
Heptachlor	mouse	0.03	70 days	oral in diet	reproduction	1.63	0.33	ATSDR 1993d
Heptachlor	mink	1.00	181 days	oral in diet	reproduction	1.00	0.20	Sample et al. 1996
Heptachlor epoxide	mouse	0.03	70 days	oral in diet	reproduction	1.63	0.33	ATSDR 1993d
Heptachlor epoxide	mink	1.00	181 days	oral in diet	reproduction	1.00	0.20	Sample et al. 1996
Methoxychlor	rat	0.35	11 months	oral in diet	reproduction	8.00	4.00	Sample et al. 1996
Toxaphene	rat	0.35	3 generations	oral in diet	reproduction	40.0	8.00	Sample et al. 1996
Semivolatile Organics								
1,2,4-Trichlorobenzene	rat	0.35	3 generations	oral in water	reproduction	106	53	Coulston and Kolbye 1994
1,2-Dichlorobenzene	rat	0.35	chronic	oral (gavage)	liver/kidney	429	85.7	Coulston and Kolbye 1994

Table 5-3
Ingestion Screening Values for Mammals
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference
1,3-Dichlorobenzene	rat	0.35	chronic	oral (gavage)	liver/kidney	429	85.7	Coulston and Kolbye 1994
1,4-Dichlorobenzene	rat	0.35	GD 6-15	oral (gavage)	developmental	500	250	ATSDR 1998a
4-Bromophenyl-phenylether	--	--	--	--	--	NA	NA	--
4-Chlorophenyl-phenylether	--	--	--	--	--	NA	NA	--
Acenaphthene	mouse	0.03	13 weeks	oral (gavage)	reproduction	700	350	ATSDR 1995
Acenaphthylene	mouse	0.03	13 weeks	oral (gavage)	reproduction	700	350	ATSDR 1995
Anthracene	mouse	0.03	13 weeks	oral (gavage)	reproduction	5,000	1,000	ATSDR 1995
Benzo(a)anthracene	mouse	0.03	GD 7-16	oral (gavage)	reproduction	10.0	2.00	Sample et al. 1996
Benzo(a)pyrene	mouse	0.03	GD 7-16	oral (gavage)	reproduction	10.0	2.00	Sample et al. 1996
Benzo(b)fluoranthene	mouse	0.03	GD 7-16	oral (gavage)	reproduction	10.0	2.00	Sample et al. 1996
Benzo(g,h,i)perylene	mouse	0.03	GD 7-16	oral (gavage)	reproduction	10.0	2.00	Sample et al. 1996
Benzo(k)fluoranthene	mouse	0.03	GD 7-16	oral (gavage)	reproduction	10.0	2.00	Sample et al. 1996
Chrysene	mouse	0.03	GD 7-16	oral (gavage)	reproduction	10.0	2.00	Sample et al. 1996
Dibenz(a,h)anthracene	mouse	0.03	GD 7-16	oral (gavage)	reproduction	10.0	2.00	Sample et al. 1996
Fluoranthene	mouse	0.03	13 weeks	oral (gavage)	reproduction	2,500	500	ATSDR 1995
Fluorene	mouse	0.03	13 weeks	oral (gavage)	reproduction	2,500	500	ATSDR 1995
Hexachlorobenzene	rat	0.35	4 generations	oral in diet	reproduction	2.00	1.00	ATSDR 1996
Hexachlorobenzene	dog	10.0	1 year	oral	systemic	12.0	1.20	ATSDR 1996
Hexachlorobutadiene	rat	0.35	GD 1-22; LD 1-21	oral in diet	developmental	20.0	2.00	ATSDR 1994c
Hexachlorocyclopentadiene	mouse	0.03	GD 6-15	oral (gavage)	developmental	375	75.0	ATSDR 1999b
Hexachloroethane	rat	0.35	GD 6-16	oral (gavage)	reproduction	500	100	ATSDR 1997b
Indeno(1,2,3-cd)pyrene	mouse	0.03	GD 7-16	oral (gavage)	reproduction	10.0	2.00	Sample et al. 1996
Pentachlorophenol	rat	0.35	2 generations	oral in diet	developmental	25.0	5.00	ATSDR 1994d
Phenanthrene	mouse	0.03	13 weeks	oral (gavage)	reproduction	2,500	500	ATSDR 1995
Pyrene	mouse	0.03	GD 7-16	oral (gavage)	reproduction	10.0	2.00	Sample et al. 1996
Volatile Organics								
1,1,2,2-Tetrachloroethane	rat	0.35	78 weeks	oral (gavage)	reproduction	380	76.0	ATSDR 1996
Dioxins/Furans								
Dioxin/furan (TEQ) - Mammal	rat	0.35	3 generations	oral in diet	reproduction	0.00001	0.000001	Sample et al. 1996
Dioxin/furan (TEQ) - Bird	rat	0.35	3 generations	oral in diet	reproduction	0.00001	0.000001	Sample et al. 1996

Table 5-4
Ingestion Screening Values for Birds
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference
Inorganics								
Arsenic	brown-headed cowbird	0.049	7 months	oral in diet	survival	7.38	2.46	Sample et al. 1996
Arsenic	mallard	1.00	128 days	oral in diet	survival	12.8	5.14	Sample et al. 1996
Cadmium	mallard	1.15	90 days	oral in diet	reproduction	20.0	1.45	Sample et al. 1996
Chromium	American black duck	1.25	10 months	oral in diet	reproduction	5.00	1.00	Sample et al. 1996
Copper	chicken (chicks)	0.534	10 weeks	oral in diet	growth/survival	61.7	47.0	Sample et al. 1996
Lead	Japanese quail	0.15	12 weeks	oral in diet	reproduction	11.3	1.13	Sample et al. 1996
Lead	American kestrel	0.13	7 months	oral in diet	reproduction	19.3	3.85	Sample et al. 1996
Mercury	red-tailed hawk	1.10	12 weeks	oral in diet	survival/neurological	1.20	0.49	USEPA 1995b
Mercury	Japanese quail	0.15	1 year	oral in diet	reproduction	0.90	0.45	Sample et al. 1996
Mercury	mallard	1.00	3 generations	oral in diet	reproduction	0.078	0.026	USEPA 1997
Nickel	mallard	0.782	90 days	oral in diet	growth/survival	107	77.4	Sample et al. 1996
Selenium	heron	0.88	94 days	oral in diet	reproduction	9.00	1.80	Sample et al. 1996
Selenium	mallard	1.00	100 days	oral in diet	reproduction	0.80	0.40	Sample et al. 1996
Selenium	screech owl	0.20	13.7 weeks	oral in diet	reproduction	1.50	0.44	Sample et al. 1996
Silver	mallard	1.10	14 days	oral in diet	survival	178	35.6	USEPA 1999
Silver	chicken (chicks)	0.80	not specified	oral in diet	growth	35.0	7.00	Eisler 1996
Zinc	chicken	1.94	44 weeks	oral in diet	reproduction	131	14.5	Sample et al. 1996
Pesticides/PCBs								
4,4'-DDD	Japanese quail	0.11	3 generations	oral in diet	reproduction	5.00	0.50	USEPA 1995b
4,4'-DDD	barn owl	0.47	2 years	oral in diet	reproduction	0.40	0.08	Blus 1996
4,4'-DDD	mallard	1.00	2 years	oral in diet	reproduction	0.60	0.12	USEPA 1995b
4,4'-DDD	bald eagle	4.74	112 days	oral in diet	survival	3.00	0.30	USEPA 1995b
4,4'-DDE	Japanese quail	0.11	3 generations	oral in diet	reproduction	5.00	0.50	USEPA 1995b
4,4'-DDE	barn owl	0.47	2 years	oral in diet	reproduction	0.40	0.08	Blus 1996
4,4'-DDE	mallard	1.00	2 years	oral in diet	reproduction	0.60	0.12	USEPA 1995b
4,4'-DDE	bald eagle	4.74	112 days	oral in diet	survival	3.00	0.30	USEPA 1995b
4,4'-DDT	Japanese quail	0.11	3 generations	oral in diet	reproduction	5.00	0.50	USEPA 1995b
4,4'-DDT	barn owl	0.47	2 years	oral in diet	reproduction	0.40	0.08	Blus 1996
4,4'-DDT	mallard	1.00	2 years	oral in diet	reproduction	1.50	0.60	USEPA 1995b
4,4'-DDT	bald eagle	4.74	112 days	oral in diet	survival	3.00	0.30	USEPA 1995b
Aldrin	ring-necked pheasant	1.14	5 days	oral in diet	survival	0.35	0.07	Hill et al. 1975
Aldrin	mallard	1.00	5 days	oral in diet	survival	0.78	0.16	Hill et al. 1975
alpha-BHC	Japanese quail	0.15	90 days	oral in diet	reproduction	2.25	0.56	Sample et al. 1996
alpha-Chlordane	red-winged blackbird	0.064	84 days	oral in diet	survival	10.7	2.14	Sample et al. 1996
alpha-Chlordane	northern bobwhite	0.19	not specified	oral in diet	reproduction	5.95	1.19	Wiemeyer 1996
alpha-Chlordane	mallard	1.00	not specified	oral in diet	reproduction	4.00	0.80	Wiemeyer 1996
Aroclor-1016	ring-necked pheasant	1.00	17 weeks	oral	reproduction	1.80	0.36	Sample et al. 1996
Aroclor-1016	screech owl	0.181	2 generations	oral in diet	reproduction	2.05	0.41	Sample et al. 1996

Table 5-4
Ingestion Screening Values for Birds
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference
Aroclor-1016	mallard	1.00	1 month	oral in diet	reproduction	7.50	1.50	USEPA 1995b
Aroclor-1221	ring-necked pheasant	1.00	17 weeks	oral	reproduction	1.80	0.36	Sample et al. 1996
Aroclor-1221	screech owl	0.181	2 generations	oral in diet	reproduction	2.05	0.41	Sample et al. 1996
Aroclor-1221	mallard	1.00	1 month	oral in diet	reproduction	7.50	1.50	USEPA 1995b
Aroclor-1232	ring-necked pheasant	1.00	17 weeks	oral	reproduction	1.80	0.36	Sample et al. 1996
Aroclor-1232	screech owl	0.181	2 generations	oral in diet	reproduction	2.05	0.41	Sample et al. 1996
Aroclor-1232	mallard	1.00	1 month	oral in diet	reproduction	7.50	1.50	USEPA 1995b
Aroclor-1242	ring-necked pheasant	1.00	17 weeks	oral	reproduction	1.80	0.36	Sample et al. 1996
Aroclor-1242	screech owl	0.181	2 generations	oral in diet	reproduction	2.05	0.41	Sample et al. 1996
Aroclor-1242	mallard	1.00	1 month	oral in diet	reproduction	7.50	1.50	USEPA 1995b
Aroclor-1248	ring-necked pheasant	1.00	17 weeks	oral	reproduction	1.80	0.36	Sample et al. 1996
Aroclor-1248	screech owl	0.181	2 generations	oral in diet	reproduction	2.05	0.41	Sample et al. 1996
Aroclor-1248	mallard	1.00	1 month	oral in diet	reproduction	7.50	1.50	USEPA 1995b
Aroclor-1254	ring-necked pheasant	1.00	17 weeks	oral	reproduction	1.80	0.36	Sample et al. 1996
Aroclor-1254	screech owl	0.181	2 generations	oral in diet	reproduction	2.05	0.41	Sample et al. 1996
Aroclor-1254	mallard	1.00	1 month	oral in diet	reproduction	7.50	1.50	USEPA 1995b
Aroclor-1260	ring-necked pheasant	1.00	17 weeks	oral	reproduction	1.80	0.36	Sample et al. 1996
Aroclor-1260	screech owl	0.181	2 generations	oral in diet	reproduction	2.05	0.41	Sample et al. 1996
Aroclor-1260	mallard	1.00	1 month	oral in diet	reproduction	7.50	1.50	USEPA 1995b
PCBs (total)	ring-necked pheasant	1.00	17 weeks	oral	reproduction	1.80	0.36	Sample et al. 1996
PCBs (total)	screech owl	0.181	2 generations	oral in diet	reproduction	2.05	0.41	Sample et al. 1996
PCBs (total)	mallard	1.00	1 month	oral in diet	reproduction	7.50	1.50	USEPA 1995b
beta-BHC	Japanese quail	0.15	90 days	oral in diet	reproduction	2.25	0.56	Sample et al. 1996
delta-BHC	Japanese quail	0.15	90 days	oral in diet	reproduction	2.25	0.56	Sample et al. 1996
Dieldrin	barn owl	0.466	2 years	oral in diet	reproduction	0.39	0.08	Sample et al. 1996
Endosulfan I	gray partridge	0.40	4 weeks	oral in diet	reproduction	50.0	10.0	Sample et al. 1996
Endosulfan II	gray partridge	0.40	4 weeks	oral in diet	reproduction	50.0	10.0	Sample et al. 1996
Endrin	mallard	1.15	>200 days	oral in diet	reproduction	1.50	0.30	Sample et al. 1996
Endrin	screech owl	0.181	>83 days	oral in diet	reproduction	0.10	0.02	Sample et al. 1996
gamma-BHC (Lindane)	mallard	1.00	8 weeks	oral (gavage)	reproduction	20.0	4.00	Sample et al. 1996
gamma-Chlordane	red-winged blackbird	0.064	84 days	oral in diet	survival	10.7	2.14	Sample et al. 1996
gamma-Chlordane	northern bobwhite	0.19	not specified	oral in diet	reproduction	5.95	1.19	Wiemeyer 1996
gamma-Chlordane	mallard	1.00	not specified	oral in diet	reproduction	4.00	0.80	Wiemeyer 1996
Heptachlor	ring-necked pheasant	1.14	5 days	oral in diet	survival	1.38	0.28	Hill et al. 1975
Heptachlor	mallard	1.00	5 days	oral in diet	survival	2.40	0.48	Hill et al. 1975
Heptachlor epoxide	ring-necked pheasant	1.14	5 days	oral in diet	survival	1.38	0.28	Hill et al. 1975
Heptachlor epoxide	mallard	1.00	5 days	oral in diet	survival	2.40	0.48	Hill et al. 1975
Methoxychlor	chicken	1.50	16 weeks	oral in diet	reproduction	1,775	355	Wiemeyer 1996
Toxaphene	American black duck	1.00	2 seasons	oral in diet	reproduction	5.00	1.00	Wiemeyer 1996

Table 5-4
Ingestion Screening Values for Birds
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference
Semivolatile Organics								
1,2,4-Trichlorobenzene	northern bobwhite	0.19	14 days	oral	survival	161	32.2	TERRETOX 2002
1,2-Dichlorobenzene	northern bobwhite	0.19	14 days	oral	survival	161	32.2	TERRETOX 2002
1,3-Dichlorobenzene	northern bobwhite	0.19	14 days	oral	survival	161	32.2	TERRETOX 2002
1,4-Dichlorobenzene	northern bobwhite	0.19	14 days	oral	survival	161	32.2	TERRETOX 2002
4-Bromophenyl-phenylether	--	--	--	--	--	NA	NA	--
4-Chlorophenyl-phenylether	--	--	--	--	--	NA	NA	--
Acenaphthene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Acenaphthylene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Anthracene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Benzo(a)anthracene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Benzo(a)pyrene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Benzo(b)fluoranthene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Benzo(g,h,i)perylene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Benzo(k)fluoranthene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Chrysene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Dibenz(a,h)anthracene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Fluoranthene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Fluorene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Hexachlorobenzene	Japanese quail	0.15	90 days	oral in diet	reproduction	0.565	0.113	Coulston and Kolbye 1994; TERRETOX 2002
Hexachlorobutadiene	Japanese quail	0.15	90 days	oral in diet	reproduction	17.0	3.39	Coulston and Kolbye 1994; TERRETOX 2002
Hexachlorocyclopentadiene	--	--	--	--	--	NA	NA	--
Hexachloroethane	--	--	--	--	--	NA	NA	--
Indeno(1,2,3-cd)pyrene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Pentachlorophenol	chicken	1.50	8 weeks	oral in diet	systemic/growth	8.52	4.26	Eisler 1989
Phenanthrene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Pyrene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Volatile Organics								
1,1,2,2-Tetrachloroethane	--	--	--	--	--	NA	NA	--
Dioxins/Furans								
Dioxin/furan (TEQ) - Mammal	ring-necked pheasant	1.00	10 weeks	injection	reproduction	0.00014	0.000014	Sample et al. 1996
Dioxin/furan (TEQ) - Bird	ring-necked pheasant	1.00	10 weeks	injection	reproduction	0.00014	0.000014	Sample et al. 1996

Table 5-5
Surface Soil Analytical Data Used in ERA
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

RI Samples		Expanded RI Samples	
SJS05-SS01-000	SJS05-SS21-000	SJS05-SS36-000	SJS05-SS53-00-03D
SJS05-SS02-000	SJS05-SS22-000	SJS05-SS37-000	SJS05-SS54-00-03D
SJS05-SS03-000	SJS05-SS23-000	SJS05-SS37P-000	SJS05-SS55-00-03D
SJS05-SS04-000	SJS05-SS24-000	SJS05-SS38-000	SJS05-SS56-00-03D
SJS05-SS05-000	SJS05-SS25-000	SJS05-SS39-000	SJS05-SS57-00-03D
SJS05-SS06-000	SJS05-SS26-000	SJS05-SS40-00-03D	SJS05-SS58-00-03D
SJS05-SS07-000	SJS05-SS27-000	SJS05-SS41-00-03D	SJS05-SS59-00-03D
SJS05-SS07-000P[1]	SJS05-SS27-000P[1]	SJS05-SS42-00-03D	SJS05-SS60-00-03D
SJS05-SS08-000	SJS05-SS28-000	SJS05-SS42-00-03D-P[1]	SJS05-SS61-00-03D
SJS05-SS09-000	SJS05-SS30-000	SJS05-SS43-00-03D	SJS05-SS62-00-03D
SJS05-SS10-000	SJS05-SS31-000	SJS05-SS44-00-03D	SJS05-SS63-00-03D
SJS05-SS11-000	SJS05-SS32-000	SJS05-SS45-00-03D	SJS05-SS64-00-03D
SJS05-SS12-000	SJS05-SS33-000	SJS05-SS46-00-03D	SJS05-SS65-00-03D
SJS05-SS13-000	SJS05-SS34-000	SJS05-SS47-00-03D	SJS05-SS66-00-03D
SJS05-SS14-000	SJS05-SS35-000	SJS05-SS48-00-03D	SJS05-SS67-00-03D
SJS05-SS15-000		SJS05-SS48-00-03D-P[1]	
SJS05-SS16-000		SJS05-SS49-00-03D	
SJS05-SS17-000		SJS05-SS50-00-03D	
SJS05-SS18-000		SJS05-SS50-00-03D-P[1]	
SJS05-SS19-000		SJS05-SS51-00-03D	
SJS05-SS20-000		SJS05-SS52-00-03D	

[1] - Duplicate sample

Table 5-6
Soil Bioconcentration Factors For Plants and Soil Invertebrates - Step 2
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Chemical	Soil-Plant BCF (dry weight)		Soil-Invertebrate BAF (dry weight)	
	Value	Reference	Value	Reference
Arsenic	1.103	Bechtel Jacobs 1998a	0.523	Sample et al. 1998a
Cadmium	3.250	Bechtel Jacobs 1998a	40.69	Sample et al. 1998a
Chromium	0.084	Bechtel Jacobs 1998a	3.162	Sample et al. 1998a
Copper	0.625	Bechtel Jacobs 1998a	1.531	Sample et al. 1998a
Lead	0.468	Bechtel Jacobs 1998a	1.522	Sample et al. 1998a
Mercury	5.000	Bechtel Jacobs 1998a	20.63	Sample et al. 1998a
Nickel	1.411	Bechtel Jacobs 1998a	4.730	Sample et al. 1998a
Selenium	3.012	Bechtel Jacobs 1998a	1.340	Sample et al. 1998a
Silver	0.037	Bechtel Jacobs 1998a	15.34	Sample et al. 1998a
Tin	0.030	Baes et al. 1984	1.000	--
Zinc	1.820	Bechtel Jacobs 1998a	12.89	Sample et al. 1998a
Pesticides/PCBs				
4,4'-DDD	0.0151	Travis and Arms 1988	2.00	Menzie et al. 1992
4,4'-DDE	0.0216	Travis and Arms 1988	10.6	Menzie et al. 1992
4,4'-DDT	0.0237	Travis and Arms 1988	0.70	Menzie et al. 1992
Aldrin	0.0431	Travis and Arms 1988	3.30	Edwards and Bohlen 1992
alpha-BHC	0.2633	Travis and Arms 1988	1.00	--
alpha-Chlordane	0.0172	Travis and Arms 1988	4.00	Edwards and Bohlen 1992
Aroclor-1016	0.0224	Travis and Arms 1988	15.9	Sample et al. 1998a
Aroclor-1221	0.0744	Travis and Arms 1988	15.9	Sample et al. 1998a
Aroclor-1232	0.0437	Travis and Arms 1988	15.9	Sample et al. 1998a
Aroclor-1242	0.0224	Travis and Arms 1988	15.9	Sample et al. 1998a
Aroclor-1248	0.0101	Travis and Arms 1988	15.9	Sample et al. 1998a
Aroclor-1254	0.0068	Travis and Arms 1988	15.9	Sample et al. 1998a
Aroclor-1260	0.0045	Travis and Arms 1988	15.9	Sample et al. 1998a
PCBs (total)	0.0068	Travis and Arms 1988	15.9	Sample et al. 1998a
beta-BHC	0.2633	Travis and Arms 1988	1.00	--
delta-BHC	0.1653	Travis and Arms 1988	1.00	--
Dieldrin	0.3089	Travis and Arms 1988	8.00	Beyer and Gish 1980
Endosulfan I	0.3436	Travis and Arms 1988	1.00	--
Endosulfan II	0.3131	Travis and Arms 1988	1.00	--

Table 5-6
Soil Bioconcentration Factors For Plants and Soil Invertebrates - Step 2
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Chemical	Soil-Plant BCF (dry weight)		Soil-Invertebrate BAF (dry weight)	
	Value	Reference	Value	Reference
Endrin	0.7948	Travis and Arms 1988	3.60	Edwards and Bohlen 1992
gamma-BHC (Lindane)	0.3173	Travis and Arms 1988	1.00	--
gamma-Chlordane	0.0172	Travis and Arms 1988	4.00	Edwards and Bohlen 1992
Heptachlor	0.0548	Travis and Arms 1988	3.00	Edwards and Bohlen 1992
Heptachlor epoxide	0.3673	Travis and Arms 1988	8.39	USEPA 1999
Methoxychlor	0.1447	Travis and Arms 1988	1.00	--
Toxaphene	0.1217	Travis and Arms 1988	1.00	--
Semivolatile Organics				
1,2,4-Trichlorobenzene	0.2186	Travis and Arms 1988	0.56	Beyer 1996
1,2-Dichlorobenzene	0.5475	Travis and Arms 1988	1.00	--
1,3-Dichlorobenzene	0.3673	Travis and Arms 1988	1.00	--
1,4-Dichlorobenzene	0.5055	Travis and Arms 1988	1.00	--
4-Bromophenyl-phenylether	0.0578	Travis and Arms 1988	1.00	--
4-Chlorophenyl-phenylether	0.1697	Travis and Arms 1988	1.00	--
Acenaphthene	0.2564	Travis and Arms 1988	0.30	Beyer and Stafford 1993
Acenaphthylene	0.1653	Travis and Arms 1988	0.22	Beyer and Stafford 1993
Anthracene	0.1051	Travis and Arms 1988	0.32	Beyer and Stafford 1993
Benzo(a)anthracene	0.0222	Travis and Arms 1988	0.27	Beyer and Stafford 1993
Benzo(a)pyrene	0.0135	Travis and Arms 1988	0.34	Beyer and Stafford 1993
Benzo(b)fluoranthene	0.0174	Travis and Arms 1988	0.21	Beyer and Stafford 1993
Benzo(g,h,i)perylene	0.0061	Travis and Arms 1988	0.15	Beyer and Stafford 1993
Benzo(k)fluoranthene	0.0112	Travis and Arms 1988	0.21	Beyer and Stafford 1993
Chrysene	0.0289	Travis and Arms 1988	0.44	Beyer and Stafford 1993
Dibenz(a,h)anthracene	0.0068	Travis and Arms 1988	0.49	Beyer and Stafford 1993
Fluoranthene	0.0617	Travis and Arms 1988	0.37	Beyer and Stafford 1993
Fluorene	0.1790	Travis and Arms 1988	0.20	Beyer and Stafford 1993
Hexachlorobenzene	0.0367	Travis and Arms 1988	1.69	Beyer 1996
Hexachlorobutadiene	0.0705	Travis and Arms 1988	1.00	--
Hexachlorocyclopentadiene	0.0467	Travis and Arms 1988	1.00	--
Hexachloroethane	0.2399	Travis and Arms 1988	1.00	--
Indeno(1,2,3-cd)pyrene	0.0061	Travis and Arms 1988	0.41	Beyer and Stafford 1993
Pentachlorophenol	0.0492	Travis and Arms 1988	8.00	van Gestel and Ma 1988

Table 5-6
Soil Bioconcentration Factors For Plants and Soil Invertebrates - Step 2
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Chemical	Soil-Plant BCF (dry weight)		Soil-Invertebrate BAF (dry weight)	
	Value	Reference	Value	Reference
Phenanthrene	0.1154	Travis and Arms 1988	0.28	Beyer and Stafford 1993
Pyrene	0.0687	Travis and Arms 1988	0.39	Beyer and Stafford 1993
Volatile Organics				
1,1,2,2-Tetrachloroethane	1.7899	Travis and Arms 1988	1.00	--
Dioxin/Furans				
Dioxin/furan (TEQ) - Mammal	0.0075	Travis and Arms 1988	22.2	Sample et al. 1998a
Dioxin/furan (TEQ) - Bird	0.0075	Travis and Arms 1988	22.2	Sample et al. 1998a

Table 5-7
Soil Bioaccumulation Factors For Small Mammals - Step 2
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Chemical	Soil-Mouse BAF (dry weight)		Soil-Vole BAF (dry weight)		Soil-Shrew BAF (dry weight)	
	Value	Reference	Value	Reference	Value	Reference
Inorganics						
Arsenic	0.014	Sample et al. 1998b	0.016	Sample et al. 1998b	0.015	Sample et al. 1998b
Cadmium	0.462	Sample et al. 1998b	0.448	Sample et al. 1998b	7.017	Sample et al. 1998b
Chromium	0.349	Sample et al. 1998b	0.309	Sample et al. 1998b	0.333	Sample et al. 1998b
Copper	0.554	Sample et al. 1998b	1.290	Sample et al. 1998b	1.117	Sample et al. 1998b
Lead	0.286	Sample et al. 1998b	0.187	Sample et al. 1998b	0.339	Sample et al. 1998b
Mercury	0.130	Sample et al. 1998b	0.192	Sample et al. 1998b	0.192	Sample et al. 1998b
Nickel	0.589	Sample et al. 1998b	0.898	Sample et al. 1998b	0.578	Sample et al. 1998b
Selenium	1.263	Sample et al. 1998b	1.187	Sample et al. 1998b	1.187	Sample et al. 1998b
Silver	0.810	Sample et al. 1998b	0.007	Sample et al. 1998b	0.501	Sample et al. 1998b
Tin	--	see text	--	see text	--	see text
Zinc	2.782	Sample et al. 1998b	2.317	Sample et al. 1998b	2.901	Sample et al. 1998b
Pesticides/PCBs						
4,4'-DDD	--	see text	--	see text	--	see text
4,4'-DDE	--	see text	--	see text	--	see text
4,4'-DDT	--	see text	--	see text	--	see text
Aldrin	--	see text	--	see text	--	see text
alpha-BHC	--	see text	--	see text	--	see text
alpha-Chlordane	--	see text	--	see text	--	see text
Aroclor-1016	--	see text	--	see text	--	see text
Aroclor-1221	--	see text	--	see text	--	see text
Aroclor-1232	--	see text	--	see text	--	see text
Aroclor-1242	--	see text	--	see text	--	see text
Aroclor-1248	--	see text	--	see text	--	see text
Aroclor-1254	--	see text	--	see text	--	see text
Aroclor-1260	--	see text	--	see text	--	see text
PCBs (total)	--	see text	--	see text	--	see text
beta-BHC	--	see text	--	see text	--	see text
delta-BHC	--	see text	--	see text	--	see text
Dieldrin	--	see text	--	see text	--	see text
Endosulfan I	--	see text	--	see text	--	see text
Endosulfan II	--	see text	--	see text	--	see text
Endrin	--	see text	--	see text	--	see text
gamma-BHC (Lindane)	--	see text	--	see text	--	see text
gamma-Chlordane	--	see text	--	see text	--	see text
Heptachlor	--	see text	--	see text	--	see text
Heptachlor epoxide	--	see text	--	see text	--	see text
Methoxychlor	--	see text	--	see text	--	see text
Toxaphene	--	see text	--	see text	--	see text

Table 5-7
Soil Bioaccumulation Factors For Small Mammals - Step 2
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Chemical	Soil-Mouse BAF (dry weight)		Soil-Vole BAF (dry weight)		Soil-Shrew BAF (dry weight)	
	Value	Reference	Value	Reference	Value	Reference
Semivolatile Organics						
1,2,4-Trichlorobenzene	--	see text	--	see text	--	see text
1,2-Dichlorobenzene	--	see text	--	see text	--	see text
1,3-Dichlorobenzene	--	see text	--	see text	--	see text
1,4-Dichlorobenzene	--	see text	--	see text	--	see text
4-Bromophenyl-phenylether	--	see text	--	see text	--	see text
4-Chlorophenyl-phenylether	--	see text	--	see text	--	see text
Acenaphthene	--	see text	--	see text	--	see text
Acenaphthylene	--	see text	--	see text	--	see text
Anthracene	--	see text	--	see text	--	see text
Benzo(a)anthracene	--	see text	--	see text	--	see text
Benzo(a)pyrene	--	see text	--	see text	--	see text
Benzo(b)fluoranthene	--	see text	--	see text	--	see text
Benzo(g,h,i)perylene	--	see text	--	see text	--	see text
Benzo(k)fluoranthene	--	see text	--	see text	--	see text
Chrysene	--	see text	--	see text	--	see text
Dibenz(a,h)anthracene	--	see text	--	see text	--	see text
Fluoranthene	--	see text	--	see text	--	see text
Fluorene	--	see text	--	see text	--	see text
Hexachlorobenzene	--	see text	--	see text	--	see text
Hexachlorobutadiene	--	see text	--	see text	--	see text
Hexachlorocyclopentadiene	--	see text	--	see text	--	see text
Hexachloroethane	--	see text	--	see text	--	see text
Indeno(1,2,3-cd)pyrene	--	see text	--	see text	--	see text
Pentachlorophenol	--	see text	--	see text	--	see text
Phenanthrene	--	see text	--	see text	--	see text
Pyrene	--	see text	--	see text	--	see text
Volatile Organics						
1,1,2,2-Tetrachloroethane	--	see text	--	see text	--	see text
Dioxin/Furans						
Dioxin/furan (TEQ) - Mammal	2.200	Sample et al. 1998b	2.200	Sample et al. 1998b	2.200	Sample et al. 1998b
Dioxin/furan (TEQ) - Bird	2.200	Sample et al. 1998b	2.200	Sample et al. 1998b	2.200	Sample et al. 1998b

Table 5-8
Exposure Parameters for Upper Trophic Level Ecological Receptors - Step 2
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Receptor	Body Weight (kg)		Water Ingestion Rate (L/day)		Food Ingestion Rate (kg/day - dry)	
	Value	Reference	Value	Reference	Value	**Reference**
Birds						
American robin	0.064	USEPA 1993	0.0129	allometric equation	0.0074	Levey and Karasov 1989
American woodcock	0.145	Dunning 1993	0.0233	allometric equation	0.0292	USEPA 1993
Red-tailed hawk	0.957	USEPA 1993	0.0680	allometric equation	0.0395	Sample and Suter 1994
Mammals						
Deer mouse	0.012	Silva and Downing 1995	0.0040	USEPA 1993a	0.0007	USEPA 1993
Red fox	3.17	Silva and Downing 1995	0.4115	allometric equation	0.1476	Sample and Suter 1994
Short-tailed shrew	0.013	USEPA 1993	0.0048	USEPA 1993a	0.0019	USEPA 1993

Receptor	Dietary Composition (percent)							Soil/ Sediment Ingestion	
	Terr. Plants	Soil Invert.	Small Mammals	Fish/ Frogs	Aquatic Plants	Benthic Invert.	Reference	Value	Reference
Birds									
American robin	51.9	43.5	0	0	0	0	Martin et al. 1951	4.6	Sample and Suter 1994
American woodcock	0	89.6	0	0	0	0	USEPA 1993a	10.4	Beyer et al. 1994
Red-tailed hawk	0	0	100	0	0	0	USEPA 1993a; Sample and Suter 1994	0	Sample and Suter 1994
Mammals									
Deer mouse	53.0	45.0	0	0	0	0	Martin et al. 1951	2.0	Beyer et al. 1994
Red fox	7.0	2.8	87.4	0	0	0	USEPA 1993	2.8	Beyer et al. 1994
Short-tailed shrew	4.7	82.3	0	0	0	0	USEPA 1993; Sample and Suter 1994	13.0	Sample and Suter 1994

Table 5-9
Soil Bioconcentration Factors For Plants and Soil Invertebrates - Step 3
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Chemical	Soil-Plant BCF (dry weight)		Soil-Invertebrate BAF (dry weight)	
	Value	Reference	Value	Reference
Inorganics				
Arsenic	0.037	Bechtel Jacobs 1998	0.258	Sample et al. 1998a
Cadmium	0.514	Bechtel Jacobs 1998	7.660	Sample et al. 1998a
Chromium	0.048	Bechtel Jacobs 1998	0.320	Sample et al. 1998a
Copper	0.123	Bechtel Jacobs 1998	0.468	Sample et al. 1998a
Lead	0.038	Bechtel Jacobs 1998	0.307	Sample et al. 1998a
Mercury	0.344	Bechtel Jacobs 1998	1.186	Sample et al. 1998a
Nickel	0.034	Bechtel Jacobs 1998	1.656	Sample et al. 1998a
Selenium	0.567	Bechtel Jacobs 1998	0.982	Sample et al. 1998a
Silver	0.013	Bechtel Jacobs 1998	2.045	Sample et al. 1998a
Tin	0.030	Baes et al. 1984	1.000	--
Zinc	0.358	Bechtel Jacobs 1998	2.482	Sample et al. 1998a
Pesticides/PCBs				
4,4'-DDD	0.0115	Travis and Arms 1988	2.00	Menzie et al. 1992
4,4'-DDE	0.0048	Travis and Arms 1988	10.60	Menzie et al. 1992
4,4'-DDT	0.0065	Travis and Arms 1988	0.70	Menzie et al. 1992
Aldrin	0.0068	Travis and Arms 1988	3.30	Edwards and Bohlen 1992
alpha-BHC	0.2464	Travis and Arms 1988	1.00	--
alpha-Chlordane	0.0086	Travis and Arms 1988	4.00	Edwards and Bohlen 1992
Aroclor-1016	0.0224	Travis and Arms 1988	4.30	Sample et al. 1998a
Aroclor-1221	0.0744	Travis and Arms 1988	4.30	Sample et al. 1998a
Aroclor-1232	0.0437	Travis and Arms 1988	4.30	Sample et al. 1998a
Aroclor-1242	0.0224	Travis and Arms 1988	4.30	Sample et al. 1998a
Aroclor-1248	0.0101	Travis and Arms 1988	4.30	Sample et al. 1998a
Aroclor-1254	0.0068	Travis and Arms 1988	4.30	Sample et al. 1998a
Aroclor-1260	0.0045	Travis and Arms 1988	4.30	Sample et al. 1998a
PCBs (total)	0.0068	Travis and Arms 1988	4.30	Sample et al. 1998a
beta-BHC	0.2431	Travis and Arms 1988	1.00	--
delta-BHC	0.1653	Travis and Arms 1988	1.00	--
Dieldrin	0.0305	Travis and Arms 1988	8.00	Beyer and Gish 1980
Endosulfan I	0.2367	Travis and Arms 1988	1.00	--
Endosulfan II	0.0945	Travis and Arms 1988	1.00	--
Endrin	0.0461	Travis and Arms 1988	3.60	Edwards and Bohlen 1992
gamma-BHC (Lindane)	0.2704	Travis and Arms 1988	1.00	--
gamma-Chlordane	0.0086	Travis and Arms 1988	4.00	Edwards and Bohlen 1992
Heptachlor	0.0093	Travis and Arms 1988	3.00	Edwards and Bohlen 1992
Heptachlor epoxide	0.0499	Travis and Arms 1988	8.39	USEPA 1999
Methoxychlor	0.0448	Travis and Arms 1988	1.00	--
Toxaphene	0.0256	Travis and Arms 1988	1.00	--

Table 5-9
Soil Bioconcentration Factors For Plants and Soil Invertebrates - Step 3
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Chemical	Soil-Plant BCF (dry weight)		Soil-Invertebrate BAF (dry weight)	
	Value	Reference	Value	Reference
Semivolatile Organics				
1,2,4-Trichlorobenzene	0.1863	Travis and Arms 1988	0.56	Beyer 1996
1,2-Dichlorobenzene	0.4031	Travis and Arms 1988	1.00	--
1,3-Dichlorobenzene	0.3673	Travis and Arms 1988	1.00	--
1,4-Dichlorobenzene	0.4085	Travis and Arms 1988	1.00	--
4-Bromophenyl-phenylether	0.0499	Travis and Arms 1988	1.00	--
4-Chlorophenyl-phenylether	0.0533	Travis and Arms 1988	1.00	--
Acenaphthene	0.2100	Travis and Arms 1988	0.30	Beyer and Stafford 1993
Acenaphthylene	0.1653	Travis and Arms 1988	0.22	Beyer and Stafford 1993
Anthracene	0.0908	Travis and Arms 1988	0.32	Beyer and Stafford 1993
Benzo(a)anthracene	0.0197	Travis and Arms 1988	0.27	Beyer and Stafford 1993
Benzo(a)pyrene	0.0114	Travis and Arms 1988	0.34	Beyer and Stafford 1993
Benzo(b)fluoranthene	0.0101	Travis and Arms 1988	0.21	Beyer and Stafford 1993
Benzo(g,h,i)perylene	0.0052	Travis and Arms 1988	0.15	Beyer and Stafford 1993
Benzo(k)fluoranthene	0.0101	Travis and Arms 1988	0.21	Beyer and Stafford 1993
Chrysene	0.0197	Travis and Arms 1988	0.44	Beyer and Stafford 1993
Dibenz(a,h)anthracene	0.0053	Travis and Arms 1988	0.49	Beyer and Stafford 1993
Fluoranthene	0.0425	Travis and Arms 1988	0.37	Beyer and Stafford 1993
Fluorene	0.1428	Travis and Arms 1988	0.20	Beyer and Stafford 1993
Hexachlorobenzene	0.0153	Travis and Arms 1988	1.69	Beyer 1996
Hexachlorobutadiene	0.0642	Travis and Arms 1988	1.00	--
Hexachlorocyclopentadiene	0.0297	Travis and Arms 1988	1.00	--
Hexachloroethane	0.1888	Travis and Arms 1988	1.00	--
Indeno(1,2,3-cd)pyrene	0.0056	Travis and Arms 1988	0.41	Beyer and Stafford 1993
Pentachlorophenol	0.0443	Travis and Arms 1988	5.18	van Gestel and Ma 1988
Phenanthrene	0.0908	Travis and Arms 1988	0.28	Beyer and Stafford 1993
Pyrene	0.0431	Travis and Arms 1988	0.39	Beyer and Stafford 1993
Volatile Organics				
1,1,2,2-Tetrachloroethane	1.6091	Travis and Arms 1988	1.00	--
Dioxin/Furans				
Dioxin/furan (TEQ) - Mammal	0.0065	Travis and Arms 1988	8.27	Sample et al. 1998a
Dioxin/furan (TEQ) - Bird	0.0065	Travis and Arms 1988	8.27	Sample et al. 1998a

Table 5-10
Soil Bioaccumulation Factors For Small Mammals - Step 3
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Chemical	Soil-Mouse BAF (dry weight)		Soil-Vole BAF (dry weight)		Soil-Shrew BAF (dry weight)	
	Value	Reference	Value	Reference	Value	Reference
Inorganics						
Arsenic	0.003	Sample et al. 1998b	0.005	Sample et al. 1998b	0.004	Sample et al. 1998b
Cadmium	0.144	Sample et al. 1998b	0.134	Sample et al. 1998b	2.212	Sample et al. 1998b
Chromium	0.092	Sample et al. 1998b	0.088	Sample et al. 1998b	0.094	Sample et al. 1998b
Copper	0.111	Sample et al. 1998b	0.109	Sample et al. 1998b	0.502	Sample et al. 1998b
Lead	0.055	Sample et al. 1998b	0.041	Sample et al. 1998b	0.148	Sample et al. 1998b
Mercury	0.054	Sample et al. 1998b	0.067	Sample et al. 1998b	0.067	Sample et al. 1998b
Nickel	0.168	Sample et al. 1998b	0.263	Sample et al. 1998b	0.364	Sample et al. 1998b
Selenium	0.258	Sample et al. 1998b	0.273	Sample et al. 1998b	0.273	Sample et al. 1998b
Silver	0.151	Sample et al. 1998b	0.006	Sample et al. 1998b	0.036	Sample et al. 1998b
Tin	--	see text	--	see text	--	see text
Zinc	0.509	Sample et al. 1998b	0.293	Sample et al. 1998b	0.862	Sample et al. 1998b
Pesticides/PCBs						
4,4'-DDD	--	see text	--	see text	--	see text
4,4'-DDE	--	see text	--	see text	--	see text
4,4'-DDT	--	see text	--	see text	--	see text
Aldrin	--	see text	--	see text	--	see text
alpha-BHC	--	see text	--	see text	--	see text
alpha-Chlordane	--	see text	--	see text	--	see text
Aroclor-1016	--	see text	--	see text	--	see text
Aroclor-1221	--	see text	--	see text	--	see text
Aroclor-1232	--	see text	--	see text	--	see text
Aroclor-1242	--	see text	--	see text	--	see text
Aroclor-1248	--	see text	--	see text	--	see text
Aroclor-1254	--	see text	--	see text	--	see text
Aroclor-1260	--	see text	--	see text	--	see text
PCBs (total)	--	see text	--	see text	--	see text
beta-BHC	--	see text	--	see text	--	see text
delta-BHC	--	see text	--	see text	--	see text
Dieldrin	--	see text	--	see text	--	see text
Endosulfan I	--	see text	--	see text	--	see text
Endosulfan II	--	see text	--	see text	--	see text

Table 5-10
Soil Bioaccumulation Factors For Small Mammals - Step 3
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Chemical	Soil-Mouse BAF (dry weight)		Soil-Vole BAF (dry weight)		Soil-Shrew BAF (dry weight)	
	Value	Reference	Value	Reference	Value	Reference
Endrin	--	see text	--	see text	--	see text
gamma-BHC (Lindane)	--	see text	--	see text	--	see text
gamma-Chlordane	--	see text	--	see text	--	see text
Heptachlor	--	see text	--	see text	--	see text
Heptachlor epoxide	--	see text	--	see text	--	see text
Methoxychlor	--	see text	--	see text	--	see text
Toxaphene	--	see text	--	see text	--	see text
Semivolatile Organics						
1,2,4-Trichlorobenzene	--	see text	--	see text	--	see text
1,2-Dichlorobenzene	--	see text	--	see text	--	see text
1,3-Dichlorobenzene	--	see text	--	see text	--	see text
1,4-Dichlorobenzene	--	see text	--	see text	--	see text
4-Bromophenyl-phenylether	--	see text	--	see text	--	see text
4-Chlorophenyl-phenylether	--	see text	--	see text	--	see text
Acenaphthene	--	see text	--	see text	--	see text
Acenaphthylene	--	see text	--	see text	--	see text
Anthracene	--	see text	--	see text	--	see text
Benzo(a)anthracene	--	see text	--	see text	--	see text
Benzo(a)pyrene	--	see text	--	see text	--	see text
Benzo(b)fluoranthene	--	see text	--	see text	--	see text
Benzo(g,h,i)perylene	--	see text	--	see text	--	see text
Benzo(k)fluoranthene	--	see text	--	see text	--	see text
Chrysene	--	see text	--	see text	--	see text
Dibenz(a,h)anthracene	--	see text	--	see text	--	see text
Fluoranthene	--	see text	--	see text	--	see text
Fluorene	--	see text	--	see text	--	see text
Hexachlorobenzene	--	see text	--	see text	--	see text
Hexachlorobutadiene	--	see text	--	see text	--	see text
Hexachlorocyclopentadiene	--	see text	--	see text	--	see text
Hexachloroethane	--	see text	--	see text	--	see text
Indeno(1,2,3-cd)pyrene	--	see text	--	see text	--	see text
Pentachlorophenol	--	see text	--	see text	--	see text

Table 5-10
Soil Bioaccumulation Factors For Small Mammals - Step 3
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Chemical	Soil-Mouse BAF (dry weight)		Soil-Vole BAF (dry weight)		Soil-Shrew BAF (dry weight)	
	Value	Reference	Value	Reference	Value	Reference
Phenanthrene	--	see text	--	see text	--	see text
Pyrene	--	see text	--	see text	--	see text
Volatile Organics						
1,1,2,2-Tetrachloroethane	--	see text	--	see text	--	see text
Dioxin/Furans						
Dioxin/furan (TEQ) - Mammal	1.067	Sample et al. 1998b	1.067	Sample et al. 1998b	1.067	Sample et al. 1998b
Dioxin/furan (TEQ) - Bird	1.067	Sample et al. 1998b	1.067	Sample et al. 1998b	1.067	Sample et al. 1998b

Table 5-11
Exposure Parameters for Upper Trophic Level Ecological Receptors - Step 3
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Receptor	Body Weight (kg)		Water Ingestion Rate (L/day)		Food Ingestion Rate (kg/day - dry)	
	Value	Reference	Value	Reference	Value	**Reference**
Birds						
American robin	0.077	USEPA 1993a	0.0106	allometric equation	0.0055	Levey and Karasov 1989
American woodcock	0.198	Dunning 1993	0.0199	allometric equation	0.0231	USEPA 1993
Red-tailed hawk	1.13	Sample and Suter 1994	0.0639	allometric equation	0.0360	Sample and Suter 1994
Mammals						
Deer mouse	0.017	Silva and Downing 1995	0.0030	USEPA 1993a	0.0005	USEPA 1993
Red fox	4.06	Silva and Downing 1995	0.3494	allometric equation	0.1231	Sample and Suter 1994
Short-tailed shrew	0.017	USEPA 1993a	0.0038	USEPA 1993a	0.0015	USEPA 1993

Receptor	Dietary Composition (percent)							Soil/ Sediment Ingestion	
	Terr. Plants	Soil Invert.	Small Mammals	Fish/ Frogs	Aquatic Plants	Benthic Invert.	Reference	Value	Reference
Birds									
American robin	51.9	43.5	0	0	0	0	Martin et al. 1951	4.6	Sample and Suter 1994
American woodcock	0	89.6	0	0	0	0	USEPA 1993	10.4	Beyer et al. 1994
Red-tailed hawk	0	0	100	0	0	0	USEPA 1993a; Sample and Suter 1994	0	Sample and Suter 1994
Mammals									
Deer mouse	53.0	45.0	0	0	0	0	Martin et al. 1951	2.0	Beyer et al. 1994
Red fox	7.0	2.8	87.4	0	0	0	USEPA 1993a	2.8	Beyer et al. 1994
Short-tailed shrew	4.7	82.3	0	0	0	0	USEPA 1993; Sample and Suter 1994	13.0	Sample and Suter 1994

Table 5-12
Summary Statisitcs - Surface Soil
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Inorganics (MG/KG)						
Aluminum	5.80 - 92.0	66 / 66	22,200	SJS05-SS49-00-03D	8,856	5,264
Antimony	0.31 - 28.0	25 / 51	56.5	SJS05-SS44-00-03D	4.50	10.8
Arsenic	0.30 - 4.60	66 / 66	152	SJS05-SS11-000	17.4	28.4
Barium	0.030 - 92.0	66 / 66	23,900	SJS05-SS36-000	987	3,599
Beryllium	0.020 - 2.30	66 / 66	1.30	SJS05-SS18-000	0.40	0.29
Cadmium	0.050 - 2.30	47 / 66	47.8	SJS05-SS38-000	2.22	6.84
Calcium	8.80 - 5,500	66 / 66	165,000	SJS05-SS51-00-03D	7,466	22,256
Chromium	0.17 - 4.60	66 / 66	867	SJS05-SS19-000	35.2	105
Cobalt	0.080 - 23.0	64 / 66	17.7	SJS05-SS01-000	3.95	3.25
Copper	0.17 - 320	66 / 66	209,000	SJS05-SS44-00-03D	4,865	28,312
Cyanide	0.17 - 1.10	18 / 59	5.20	SJS05-SS51-00-03D	0.33	0.70
Iron	2.66 - 46.0	66 / 66	120,000	SJS05-SS01-000	20,488	18,260
Lead	0.15 - 1.40	66 / 66	7,210	SJS05-SS01-000	505	1,145
Magnesium	3.70 - 2,300	66 / 66	9,820	SJS05-SS36-000	2,056	1,546
Manganese	0.050 - 6.90	66 / 66	1,870	SJS05-SS36-000	206	269
Mercury	0.0100 - 0.24	58 / 65	1.10	SJS05-SS33-000	0.24	0.23
Nickel	0.14 - 18.0	65 / 66	198	SJS05-SS44-00-03D	15.2	29.0
Potassium	2.00 - 2,300	60 / 66	4,430	SJS05-SS35-000	1,440	1,009
Selenium	0.40 - 2.30	13 / 66	6.10	SJS05-SS44-00-03D	0.56	0.77
Silver	0.14 - 4.60	33 / 66	23.4	SJS05-SS66-00-03D	1.74	3.83
Sodium	9.07 - 2,300	38 / 66	6,410	SJS05-SS18-000	377	836
Thallium	0.31 - 4.60	19 / 66	7.70	SJS05-SS44-00-03D	0.78	1.23
Vanadium	0.090 - 23.0	66 / 66	69.1	SJS05-SS35-000	29.6	15.5
Zinc	0.29 - 260	66 / 66	124,000	SJS05-SS44-00-03D	2,540	15,290
Pesticide/Polychlorinated Biphenyls (UG/KG)						
4,4'-DDD	3.30 - 57.0	43 / 61	310	SJS05-SS09-000	15.5	40.3
4,4'-DDE	3.30 - 600	59 / 62	4,700	SJS05-SS35-000	283	697
4,4'-DDT	3.30 - 600	56 / 62	3,100	SJS05-SS32-000	203	586
Aldrin	1.70 - 29.0	0 / 62	--	--	1.70	2.48

1-One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 5-12
Summary Statisitcs - Surface Soil
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Aroclor-1016	33.0 - 370	0 / 34	--	--	26.8	28.5
Aroclor-1221	67.0 - 760	0 / 34	--	--	54.3	58.7
Aroclor-1232	33.0 - 370	0 / 34	--	--	26.8	28.5
Aroclor-1242	33.0 - 370	0 / 34	--	--	26.8	28.5
Aroclor-1248	33.0 - 370	0 / 34	--	--	26.8	28.5
Aroclor-1254	33.0 - 370	0 / 34	--	--	26.8	28.5
Aroclor-1260	33.0 - 370	2 / 34	39.0	SJS05-SS08-000	27.8	28.5
Dieldrin	3.30 - 57.0	3 / 62	6.80	SJS05-SS08-000	3.46	4.88
Endosulfan I	1.70 - 29.0	0 / 62	--	--	1.70	2.48
Endosulfan II	3.30 - 57.0	0 / 62	--	--	3.34	4.86
Endosulfan sulfate	3.30 - 57.0	4 / 62	11.0	SJS05-SS53-00-03D	3.69	5.02
Endrin	3.30 - 57.0	0 / 62	--	--	3.34	4.86
Endrin aldehyde	3.30 - 57.0	0 / 62	--	--	3.34	4.86
Endrin ketone	3.30 - 57.0	3 / 62	20.0	SJS05-SS53-00-03D	3.82	5.38
Heptachlor	1.70 - 29.0	0 / 62	--	--	1.70	2.48
Heptachlor epoxide	1.70 - 29.0	0 / 62	--	--	1.70	2.48
Methoxychlor	17.0 - 290	0 / 62	--	--	17.0	24.8
Toxaphene	170 - 2,900	0 / 62	--	--	170	248
alpha-BHC	1.70 - 29.0	1 / 62	3.50	SJS05-SS08-000	1.74	2.49
alpha-Chlordane	1.70 - 29.0	3 / 62	2.40	SJS05-SS08-000	1.86	2.72
beta-BHC	1.70 - 29.0	0 / 62	--	--	1.70	2.48
delta-BHC	1.70 - 29.0	0 / 62	--	--	1.70	2.48
gamma-BHC (Lindane)	1.70 - 29.0	0 / 62	--	--	1.70	2.48
gamma-Chlordane	1.70 - 29.0	1 / 62	2.60	SJS05-SS08-000	1.73	2.48
Semivolatile Organic Compounds (UG/KG)						
1,1-Biphenyl	420 - 450	0 / 4	--	--	219	6.29
1,2,4-Trichlorobenzene	330 - 2,000	0 / 34	--	--	244	145
1,2-Dichlorobenzene	330 - 2,000	0 / 34	--	--	244	145
1,3-Dichlorobenzene	330 - 2,000	0 / 34	--	--	244	145
1,4-Dichlorobenzene	330 - 2,000	0 / 34	--	--	244	145

1-One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 5-12
Summary Statisitcs - Surface Soil
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
2,4,5-Trichlorophenol	830 - 5,000	0 / 38	--	--	603	345
2,4,6-Trichlorophenol	330 - 2,000	0 / 38	--	--	241	138
2,4-Dichlorophenol	330 - 2,000	0 / 38	--	--	241	138
2,4-Dimethylphenol	330 - 2,000	0 / 38	--	--	241	138
2,4-Dinitrophenol	830 - 2,000	0 / 38	--	--	563	156
2,4-Dinitrotoluene	330 - 2,000	8 / 38	3,200	SJS05-SS03-000	307	491
2,6-Dinitrotoluene	330 - 2,000	1 / 38	39.0	SJS05-SS01-000	238	141
2-Chloronaphthalene	330 - 2,000	0 / 38	--	--	241	138
2-Chlorophenol	330 - 2,000	0 / 38	--	--	241	138
2-Methylnaphthalene	330 - 2,000	2 / 66	57.0	SJS05-SS45-00-03D	239	124
2-Methylphenol	330 - 2,000	0 / 38	--	--	241	138
2-Nitroaniline	830 - 5,000	0 / 38	--	--	603	345
2-Nitrophenol	330 - 2,000	0 / 38	--	--	241	138
3,3'-Dichlorobenzidine	330 - 2,000	0 / 38	--	--	241	138
3-Nitroaniline	830 - 5,000	0 / 38	--	--	603	345
4,6-Dinitro-2-methylphenol	830 - 2,000	0 / 38	--	--	563	156
4-Bromophenyl-phenylether	330 - 2,000	0 / 38	--	--	241	138
4-Chloro-3-methylphenol	330 - 2,000	0 / 38	--	--	241	138
4-Chloroaniline	330 - 2,000	0 / 38	--	--	241	138
4-Chlorophenyl-phenylether	330 - 2,000	0 / 38	--	--	241	138
4-Methylphenol	330 - 2,000	0 / 38	--	--	241	138
4-Nitroaniline	830 - 5,000	1 / 38	460	SJS05-SS37-000	600	346
4-Nitrophenol	830 - 5,000	0 / 38	--	--	603	345
Acenaphthene	330 - 2,000	1 / 66	41.0	SJS05-SS04-000	241	121
Acenaphthylene	330 - 2,000	17 / 66	540	SJS05-SS41-00-03D	215	144
Acetophenone	420 - 450	0 / 4	--	--	28.4	4.21
Anthracene	330 - 2,000	17 / 66	450	SJS05-SS41-00-03D	219	140
Atrazine	420 - 450	0 / 4	--	--	219	6.29
Benzaldehyde	420 - 450	0 / 4	--	--	28.5	5.67
Benzo(a)anthracene	330 - 2,000	50 / 66	1,500	SJS05-SS41-00-03D	269	270

1-One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 5-12
Summary Statisitcs - Surface Soil
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Benzo(a)pyrene	330 - 2,000	47 / 66	1,200	SJS05-SS26-000	257	221
Benzo(b)fluoranthene	330 - 2,000	54 / 66	2,700	SJS05-SS41-00-03D	486	590
Benzo(g,h,i)perylene	330 - 2,000	42 / 66	2,300	SJS05-SS66-00-03D	242	296
Benzo(k)fluoranthene	330 - 2,000	45 / 66	820	SJS05-SS41-00-03D	223	170
Bis(2-chloro-1-methylethyl) ether	330 - 2,000	0 / 38	--	--	241	138
Butylbenzylphthalate	330 - 2,000	0 / 38	--	--	241	138
Caprolactam	420 - 450	0 / 4	--	--	219	6.29
Carbazole	330 - 2,000	4 / 38	69.0	SJS05-SS26-000	227	150
Chrysene	330 - 2,000	53 / 66	2,200	SJS05-SS41-00-03D	340	383
Di-n-butylphthalate	330 - 2,000	14 / 38	4,700	SJS05-SS03-000	304	737
Di-n-octylphthalate	330 - 2,000	0 / 38	--	--	241	138
Dibenz(a,h)anthracene	330 - 2,000	16 / 66	560	SJS05-SS66-00-03D	221	129
Dibenzofuran	330 - 2,000	0 / 66	--	--	243	119
Diethylphthalate	330 - 2,000	1 / 38	170	SJS05-SS12-000	239	138
Dimethyl phthalate	330 - 2,000	1 / 38	63.0	SJS05-SS12-000	236	140
Fluoranthene	330 - 2,000	52 / 66	2,000	SJS05-SS03-000	353	381
Fluorene	330 - 2,000	0 / 66	--	--	243	119
Hexachlorobenzene	330 - 2,000	0 / 38	--	--	241	138
Hexachlorobutadiene	330 - 2,000	0 / 38	--	--	241	138
Hexachlorocyclopentadiene	330 - 2,000	0 / 38	--	--	241	138
Hexachloroethane	330 - 2,000	0 / 38	--	--	241	138
Indeno(1,2,3-cd)pyrene	330 - 2,000	46 / 66	1,600	SJS05-SS66-00-03D	239	238
Isophorone	330 - 2,000	0 / 38	--	--	241	138
Naphthalene	330 - 2,000	6 / 66	90.0	SJS05-SS35-000	227	130
Nitrobenzene	330 - 2,000	0 / 38	--	--	241	138
Pentachlorophenol	830 - 5,000	0 / 38	--	--	603	345
Phenanthrene	330 - 2,000	38 / 66	390	SJS05-SS41-00-03D	186	96.8
Phenol	330 - 2,000	0 / 38	--	--	241	138
Pyrene	330 - 2,000	53 / 66	1,300	SJS05-SS26-000	299	287
bis(2-Chloroethoxy)methane	330 - 2,000	0 / 38	--	--	241	138

1-One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 5-12
Summary Statisitcs - Surface Soil
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
bis(2-Chloroethyl)ether	330 - 2,000	0 / 38	--	--	241	138
bis(2-Ethylhexyl)phthalate	280 - 2,000	4 / 38	180	SJS05-SS12-000	189	186
n-Nitroso-di-n-propylamine	330 - 2,000	0 / 38	--	--	241	138
n-Nitrosodiphenylamine	330 - 2,000	3 / 38	530	SJS05-SS03-000	227	76.1
Explosives (UG/KG)						
1,3,5-Trinitrobenzene	227 - 540	0 / 26	--	--	128	29.1
1,3-Dinitrobenzene	227 - 540	0 / 26	--	--	128	29.1
2,4,6-Trinitrotoluene	227 - 540	0 / 26	--	--	128	29.1
2,4-Dinitrotoluene	227 - 540	2 / 26	638	SJS05-SS14-000	155	108
2,6-Dinitrotoluene	227 - 540	0 / 26	--	--	128	29.1
2-Amino-4,6-dinitrotoluene	227 - 540	1 / 26	417	SJS05-SS24-000	140	63.6
2-Nitrotoluene	455 - 540	0 / 26	--	--	246	8.11
3-Nitrotoluene	455 - 540	0 / 26	--	--	246	8.11
4-Amino-2,6-dinitrotoluene	227 - 540	0 / 26	--	--	128	29.1
4-Nitrotoluene	455 - 540	0 / 26	--	--	246	8.11
HMX	455 - 540	0 / 26	--	--	246	8.11
Nitrobenzene	227 - 540	0 / 26	--	--	128	29.1
RDX	455 - 540	0 / 26	--	--	246	8.11
Tetryl	455 - 540	0 / 26	--	--	246	8.11
Volatile Organic Compounds (UG/KG)						
1,1,1-Trichloroethane	10.0 - 22.0	0 / 34	--	--	6.54	1.73
1,1,2,2-Tetrachloroethane	10.0 - 22.0	0 / 34	--	--	6.54	1.73
1,1,2-Trichloroethane	10.0 - 22.0	0 / 34	--	--	6.54	1.73
1,1-Dichloroethane	10.0 - 22.0	0 / 34	--	--	6.54	1.73
1,1-Dichloroethene	10.0 - 22.0	0 / 34	--	--	6.54	1.73
1,2-Dichloroethane	10.0 - 22.0	0 / 34	--	--	6.54	1.73
1,2-Dichloroethene (total)	10.0 - 22.0	1 / 34	1.00	SJS05-SS08-000	6.43	1.96
1,2-Dichloropropane	10.0 - 22.0	0 / 34	--	--	6.54	1.73
2-Butanone	10.0 - 22.0	2 / 34	210	SJS05-SS06-000	13.2	35.0
2-Hexanone	10.0 - 22.0	0 / 34	--	--	6.54	1.73

1-One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 5-12
Summary Statisitcs - Surface Soil
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
4-Methyl-2-pentanone	10.0 - 22.0	0 / 34	--	--	6.54	1.73
Acetone	10.0 - 22.0	11 / 34	62.0	SJS05-SS14-000	12.7	13.1
Benzene	10.0 - 22.0	0 / 34	--	--	6.54	1.73
Bromodichloromethane	10.0 - 22.0	0 / 34	--	--	6.54	1.73
Bromoform	10.0 - 22.0	0 / 34	--	--	6.54	1.73
Bromomethane	10.0 - 22.0	0 / 34	--	--	6.54	1.73
Carbon disulfide	10.0 - 22.0	0 / 34	--	--	6.38	1.55
Carbon tetrachloride	10.0 - 22.0	0 / 34	--	--	6.54	1.73
Chlorobenzene	10.0 - 22.0	0 / 34	--	--	6.54	1.73
Chloroethane	10.0 - 22.0	0 / 34	--	--	6.54	1.73
Chloroform	10.0 - 22.0	1 / 34	2.00	SJS05-SS26-000	6.46	1.88
Chloromethane	10.0 - 22.0	2 / 34	5.00	SJS05-SS26-000	6.47	1.83
Dibromochloromethane	10.0 - 22.0	0 / 34	--	--	6.54	1.73
Ethylbenzene	10.0 - 22.0	0 / 34	--	--	6.54	1.73
Methylene chloride	10.0 - 22.0	10 / 34	171	SJS05-SS12-000	36.1	46.7
Styrene	10.0 - 22.0	1 / 34	29.0	SJS05-SS34-000	7.22	4.22
Tetrachloroethene	10.0 - 22.0	3 / 34	4.00	SJS05-SS09-000	6.28	2.13
Toluene	10.0 - 22.0	5 / 34	5.00	SJS05-SS09-000	6.24	2.13
Trichloroethene	10.0 - 22.0	10 / 34	58.0	SJS05-SS27-000	9.04	9.81
Vinyl chloride	10.0 - 22.0	0 / 34	--	--	6.54	1.73
Xylene, total	10.0 - 22.0	2 / 34	3.00	SJS05-SS05-000	6.37	1.97
cis-1,3-Dichloropropene	10.0 - 22.0	0 / 34	--	--	6.54	1.73
trans-1,3-Dichloropropene	10.0 - 22.0	0 / 34	--	--	6.54	1.73
Dioxin/Furans (UG/KG)						
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	3.60E-04 - 3.90E-04	4 / 4	0.18	SJS05-SS50-00-03D	0.10	0.055
1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.40E-04 - 3.10E-04	4 / 4	0.084	SJS05-SS44-00-03D	0.035	0.033
1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.90E-04 - 3.30E-04	2 / 4	0.0077	SJS05-SS44-00-03D	0.0027	0.0034
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	1.50E-04 - 3.70E-04	4 / 4	0.0059	SJS05-SS50-00-03D	0.0036	0.0018
1,2,3,4,7,8-Hexachlorodibenzofuran	1.10E-04 - 2.60E-04	4 / 4	0.035	SJS05-SS44-00-03D	0.012	0.015
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	1.70E-04 - 4.10E-04	4 / 4	0.0091	SJS05-SS50-00-03D	0.0065	0.0024

1-One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 5-12
Summary Statisitcs - Surface Soil
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
1,2,3,6,7,8-Hexachlorodibenzofuran	1.20E-04 - 2.60E-04	4 / 4	0.013	SJS05-SS44-00-03D	0.0066	0.0047
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	1.50E-04 - 3.70E-04	4 / 4	0.017	SJS05-SS50-00-03D	0.011	0.0049
1,2,3,7,8,9-Hexachlorodibenzofuran	1.40E-04 - 2.40E-04	1 / 4	9.00E-04	SJS05-SS44-00-03D	3.55E-04	3.65E-04
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	1.90E-04 - 4.10E-04	4 / 4	0.0044	SJS05-SS50-00-03D	0.0032	0.0013
1,2,3,7,8-Pentachlorodibenzofuran	2.00E-04 - 4.20E-04	4 / 4	0.0073	SJS05-SS44-00-03D	0.0049	0.0026
2,3,4,6,7,8-Hexachlorodibenzofuran	1.20E-04 - 1.70E-04	4 / 4	0.019	SJS05-SS44-00-03D	0.0077	0.0078
2,3,4,7,8-Pentachlorodibenzofuran	1.50E-04 - 2.30E-04	4 / 4	0.011	SJS05-SS44-00-03D	0.0063	0.0040
2,3,7,8-TCDD (dioxin)	4.00E-04 - 0.0013	0 / 4	--	--	5.31E-04	1.11E-04
2,3,7,8-Tetrachlorodibenzofuran	3.50E-04 - 7.80E-04	4 / 4	0.0096	SJS05-SS66-00-03D	0.0056	0.0034
Octachlorodibenzo-p-dioxin	2.50E-04 - 4.80E-04	4 / 4	2.40	SJS05-SS50-00-03D	1.15	0.87
Octachlorodibenzofuran	1.80E-04 - 3.00E-04	4 / 4	0.10	SJS05-SS44-00-03D	0.043	0.041
Other Parameters (MG/KG)						
% Solids	-- - --	25 / 25	99.3	SJS05-SS31-000	74.4	16.8
Phosphorus	1.20 - 13.7	12 / 34	76.5	SJS05-SS30-000	8.60	17.3
pH	0.0100 - 0.0100	25 / 25	7.91	SJS05-SS10-000	5.43	1.23

1-One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 5-13
Site 5/6 - Summary Statistics - Surface Water
St. Juliens Creek, Chesapeake, Virginia

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Inorganics (UG/L)						
Aluminum	18.7 - 38.2	7 / 7	26,100	SJS05-SW05-001	7,214	9,061
Antimony	2.70 - 2.80	0 / 7	--	--	1.36	0.019
Arsenic	2.00 - 3.60	3 / 7	12.6	SJS05-SW05-001	3.40	4.27
Barium	0.20 - 0.30	7 / 7	64.8	SJS05-SW05-001	33.9	17.3
Beryllium	0.10 - 0.20	5 / 7	12.1	SJS05-SW05-001	3.00	4.22
Cadmium	0.30 - 0.30	5 / 7	4.40	SJS05-SW05-001	1.38	1.49
Calcium	31.1 - 57.9	7 / 7	141,000	SJS05-SW05-001	89,971	36,062
Chromium	0.60 - 1.10	5 / 7	2.10	SJS05-SW05-001	1.29	0.65
Cobalt	0.50 - 0.80	7 / 7	146	SJS05-SW05-001	43.9	48.8
Copper	0.80 - 1.10	7 / 7	215	SJS05-SW05-001	42.1	76.4
Cyanide	5.00 - 5.00	3 / 7	30.2	SJS05-SW02-001	12.6	13.3
Iron	17.2 - 30.8	7 / 7	46,900	SJS05-SW05-001	15,414	16,800
Lead	1.00 - 1.40	5 / 7	4,760	SJS05-SW05-001	684	1,797
Magnesium	24.3 - 26.3	7 / 7	346,000	SJS05-SW07-001	102,214	111,223
Manganese	0.30 - 0.40	7 / 7	7,590	SJS05-SW05-001	2,343	2,481
Mercury	0.10 - 0.10	0 / 7	--	--	0.050	5.75E-10
Nickel	0.90 - 0.90	7 / 7	245	SJS05-SW05-001	69.3	82.4
Potassium	13.5 - 167.0	7 / 7	120,000	SJS05-SW07-001	36,471	38,124
Selenium	2.60 - 3.10	0 / 7	--	--	1.34	0.094
Silver	0.70 - 0.90	0 / 7	--	--	0.44	0.038
Sodium	148 - 2,040	7 / 7	2,990,000	SJS05-SW07-001	613,429	1,050,824
Thallium	3.20 - 5.20	0 / 7	--	--	1.74	0.38
Vanadium	0.60 - 0.70	2 / 7	12.6	SJS05-SW05-001	2.78	4.47
Zinc	0.70 - 1.90	7 / 7	4,690	SJS05-SW05-001	1,257	1,565
Pesticide/Polychlorinated Biphenyls (UG/L)						
1,3-Dinitrobenzene	1.20 - 1.20	0 / 1	--	--	0.60	0
4,4'-DDD	0.10 - 0.11	1 / 7	0.0100	SJS05-SW06-001	0.048	0.017
4,4'-DDE	0.10 - 0.11	1 / 7	0.012	SJS05-SW04-001	0.048	0.016
4,4'-DDT	0.10 - 0.11	0 / 7	--	--	0.054	0.0019
Aldrin	0.052 - 0.057	0 / 7	--	--	0.027	0.0010
Aroclor-1016	1.00 - 1.10	0 / 7	--	--	0.54	0.019
Aroclor-1221	2.10 - 2.30	0 / 7	--	--	1.09	0.045

Table 5-13
Site 5/6 - Summary Statistics - Surface Water
St. Juliens Creek, Chesapeake, Virginia

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Aroclor-1232	1.00 - 1.10	0 / 7	--	--	0.54	0.019
Aroclor-1242	1.00 - 1.10	0 / 7	--	--	0.54	0.019
Aroclor-1248	1.00 - 1.10	0 / 7	--	--	0.54	0.019
Aroclor-1254	1.00 - 1.10	0 / 7	--	--	0.54	0.019
Aroclor-1260	1.00 - 1.10	0 / 7	--	--	0.54	0.019
Dieldrin	0.10 - 0.11	0 / 7	--	--	0.054	0.0019
Endosulfan I	0.052 - 0.057	0 / 7	--	--	0.027	0.0010
Endosulfan II	0.10 - 0.11	0 / 7	--	--	0.054	0.0019
Endosulfan sulfate	0.10 - 0.11	0 / 7	--	--	0.054	0.0019
Endrin	0.10 - 0.11	0 / 7	--	--	0.054	0.0019
Endrin aldehyde	0.10 - 0.11	0 / 7	--	--	0.054	0.0019
Endrin ketone	0.10 - 0.11	0 / 7	--	--	0.054	0.0019
Heptachlor	0.052 - 0.057	0 / 7	--	--	0.027	0.0010
Heptachlor epoxide	0.052 - 0.057	0 / 7	--	--	0.027	0.0010
Methoxychlor	0.52 - 0.57	0 / 7	--	--	0.27	0.010
Tetryl	2.00 - 2.00	0 / 1	--	--	1.00	0
Toxaphene	5.20 - 5.70	0 / 7	--	--	2.73	0.10
alpha-BHC	0.052 - 0.057	0 / 7	--	--	0.027	0.0010
alpha-Chlordane	0.052 - 0.057	0 / 7	--	--	0.027	0.0010
beta-BHC	0.052 - 0.057	0 / 7	--	--	0.027	0.0010
delta-BHC	0.052 - 0.057	0 / 7	--	--	0.027	0.0010
gamma-BHC (Lindane)	0.052 - 0.057	0 / 7	--	--	0.027	0.0010
gamma-Chlordane	0.052 - 0.057	0 / 7	--	--	0.027	0.0010
Semivolatile Organic Compounds (UG/L)						
1,2,4-Trichlorobenzene	10.0 - 13.0	0 / 7	--	--	5.57	0.45
1,2-Dichlorobenzene	10.0 - 13.0	0 / 7	--	--	5.57	0.45
1,3-Dichlorobenzene	10.0 - 13.0	0 / 7	--	--	5.57	0.45
1,4-Dichlorobenzene	10.0 - 13.0	0 / 7	--	--	5.57	0.45
2,2'-Oxybis(1-chloropropane)	10.0 - 13.0	0 / 7	--	--	5.57	0.45
2,4,5-Trichlorophenol	26.0 - 32.0	0 / 7	--	--	14.0	1.00
2,4,6-Trichlorophenol	10.0 - 13.0	0 / 7	--	--	5.57	0.45
2,4-Dichlorophenol	10.0 - 13.0	0 / 7	--	--	5.57	0.45
2,4-Dimethylphenol	10.0 - 13.0	0 / 7	--	--	5.57	0.45

Table 5-13
Site 5/6 - Summary Statistics - Surface Water
St. Juliens Creek, Chesapeake, Virginia

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
2,4-Dinitrophenol	26.0 - 32.0	0 / 7	--	--	14.0	1.00
2,4-Dinitrotoluene	10.0 - 13.0	0 / 7	--	--	5.57	0.45
2,6-Dinitrotoluene	10.0 - 13.0	0 / 7	--	--	5.57	0.45
2-Chloronaphthalene	10.0 - 13.0	0 / 7	--	--	5.57	0.45
2-Chlorophenol	10.0 - 13.0	0 / 7	--	--	5.57	0.45
2-Methylnaphthalene	10.0 - 13.0	0 / 7	--	--	5.57	0.45
2-Methylphenol	10.0 - 13.0	0 / 7	--	--	5.57	0.45
2-Nitroaniline	26.0 - 32.0	0 / 7	--	--	14.0	1.00
2-Nitrophenol	10.0 - 13.0	0 / 7	--	--	5.57	0.45
3,3'-Dichlorobenzidine	10.0 - 13.0	0 / 7	--	--	5.57	0.45
3-Nitroaniline	26.0 - 32.0	0 / 7	--	--	14.0	1.00
4,6-Dinitro-2-methylphenol	26.0 - 32.0	0 / 7	--	--	14.0	1.00
4-Bromophenyl-phenylether	10.0 - 13.0	0 / 7	--	--	5.57	0.45
4-Chloro-3-methylphenol	10.0 - 13.0	0 / 7	--	--	5.57	0.45
4-Chloroaniline	10.0 - 13.0	0 / 7	--	--	5.57	0.45
4-Chlorophenyl-phenylether	10.0 - 13.0	0 / 7	--	--	5.57	0.45
4-Methylphenol	10.0 - 13.0	1 / 7	5.00	SJS05-SW06-001	5.50	0.50
4-Nitroaniline	26.0 - 32.0	0 / 7	--	--	14.0	1.00
4-Nitrophenol	26.0 - 32.0	0 / 7	--	--	14.0	1.00
Acenaphthene	10.0 - 13.0	0 / 7	--	--	5.57	0.45
Acenaphthylene	10.0 - 13.0	0 / 7	--	--	5.57	0.45
Anthracene	10.0 - 13.0	0 / 7	--	--	5.57	0.45
Benzo(a)anthracene	10.0 - 13.0	0 / 7	--	--	5.57	0.45
Benzo(a)pyrene	10.0 - 13.0	0 / 7	--	--	5.57	0.45
Benzo(b)fluoranthene	10.0 - 13.0	0 / 7	--	--	5.57	0.45
Benzo(g,h,i)perylene	10.0 - 13.0	0 / 7	--	--	5.57	0.45
Benzo(k)fluoranthene	10.0 - 13.0	0 / 7	--	--	5.57	0.45
Butylbenzylphthalate	10.0 - 13.0	0 / 7	--	--	5.57	0.45
Carbazole	10.0 - 13.0	0 / 7	--	--	5.57	0.45
Chrysene	10.0 - 13.0	0 / 7	--	--	5.57	0.45
Di-n-butylphthalate	10.0 - 13.0	0 / 7	--	--	4.00	2.24
Di-n-octylphthalate	10.0 - 13.0	0 / 7	--	--	5.57	0.45
Dibenz(a,h)anthracene	10.0 - 13.0	0 / 7	--	--	5.57	0.45

Table 5-13
Site 5/6 - Summary Statistics - Surface Water
St. Juliens Creek, Chesapeake, Virginia

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Dibenzofuran	10.0 - 13.0	0 / 7	--	--	5.57	0.45
Diethylphthalate	10.0 - 13.0	0 / 7	--	--	5.57	0.45
Dimethyl phthalate	10.0 - 13.0	0 / 7	--	--	5.57	0.45
Fluoranthene	10.0 - 13.0	0 / 7	--	--	5.57	0.45
Fluorene	10.0 - 13.0	0 / 7	--	--	5.57	0.45
Hexachlorobenzene	10.0 - 13.0	0 / 7	--	--	5.57	0.45
Hexachlorobutadiene	10.0 - 13.0	0 / 7	--	--	5.57	0.45
Hexachlorocyclopentadiene	10.0 - 13.0	0 / 7	--	--	5.57	0.45
Hexachloroethane	10.0 - 13.0	0 / 7	--	--	5.57	0.45
Indeno(1,2,3-cd)pyrene	10.0 - 13.0	0 / 7	--	--	5.57	0.45
Isophorone	10.0 - 13.0	0 / 7	--	--	5.57	0.45
Naphthalene	10.0 - 13.0	0 / 7	--	--	5.57	0.45
Nitrobenzene	10.0 - 13.0	0 / 7	--	--	5.57	0.45
Pentachlorophenol	26.0 - 32.0	0 / 7	--	--	14.0	1.00
Phenanthrene	10.0 - 13.0	0 / 7	--	--	5.57	0.45
Phenol	10.0 - 13.0	0 / 7	--	--	5.57	0.45
Pyrene	10.0 - 13.0	0 / 7	--	--	5.57	0.45
bis(2-Chloroethoxy)methane	10.0 - 13.0	0 / 7	--	--	5.57	0.45
bis(2-Chloroethyl)ether	10.0 - 13.0	0 / 7	--	--	5.57	0.45
bis(2-Ethylhexyl)phthalate	10.0 - 13.0	1 / 7	4.00	SJS05-SW07-001	4.71	1.80
n-Nitroso-di-n-propylamine	10.0 - 13.0	0 / 7	--	--	5.57	0.45
n-Nitrosodiphenylamine	10.0 - 13.0	0 / 7	--	--	5.57	0.45
Explosives (UG/L)						
1,3,5-Trinitrobenzene	0.50 - 1.20	0 / 7	--	--	0.48	0.13
1,3-Dinitrobenzene	0.50 - 1.20	0 / 6	--	--	0.46	0.13
2,4,6-Trinitrotoluene	0.50 - 1.20	0 / 7	--	--	0.48	0.13
2,4-Dinitrotoluene	0.50 - 1.20	0 / 7	--	--	0.48	0.13
2,6-Dinitrotoluene	0.50 - 1.20	0 / 7	--	--	0.48	0.13
2-Amino-4,6-dinitrotoluene	0.50 - 1.20	0 / 7	--	--	0.48	0.13
2-Nitrotoluene	1.00 - 2.60	0 / 7	--	--	1.04	0.30
3-Nitrotoluene	1.00 - 2.60	0 / 7	--	--	1.04	0.30
4-Amino-2,6-dinitrotoluene	0.50 - 1.20	0 / 7	--	--	0.48	0.13
4-Nitrotoluene	1.00 - 2.60	0 / 7	--	--	1.04	0.30

Table 5-13
Site 5/6 - Summary Statistics - Surface Water
St. Juliens Creek, Chesapeake, Virginia

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
HMX	1.00 - 2.60	0 / 7	--	--	1.04	0.30
Nitrobenzene	0.50 - 1.20	0 / 7	--	--	0.48	0.13
RDX	1.00 - 2.60	0 / 7	--	--	1.04	0.30
Tetryl	1.00 - 2.60	0 / 6	--	--	1.04	0.32
Volatile Organic Compounds (UG/L)						
1,1,1-Trichloroethane	1.00 - 1.00	0 / 7	--	--	0.50	0.0
1,1,2,2-Tetrachloroethane	1.00 - 1.00	0 / 7	--	--	0.50	0.0
1,1,2-Trichloroethane	1.00 - 1.00	0 / 7	--	--	0.50	0.0
1,1-Dichloroethane	1.00 - 1.00	0 / 7	--	--	0.50	0.0
1,1-Dichloroethene	1.00 - 1.00	0 / 7	--	--	0.50	0.0
1,2,4-Trichlorobenzene	1.00 - 1.00	0 / 7	--	--	0.50	0.0
1,2-Dibromo-3-chloropropane	1.00 - 1.00	0 / 7	--	--	0.50	0.0
1,2-Dibromoethane	1.00 - 1.00	0 / 7	--	--	0.50	0.0
1,2-Dichlorobenzene	1.00 - 1.00	0 / 7	--	--	0.50	0.0
1,2-Dichloroethane	1.00 - 1.00	0 / 7	--	--	0.50	0.0
1,2-Dichloropropane	1.00 - 1.00	0 / 7	--	--	0.50	0.0
1,3-Dichlorobenzene	1.00 - 1.00	0 / 7	--	--	0.50	0.0
1,4-Dichlorobenzene	1.00 - 1.00	0 / 7	--	--	0.50	0.0
2-Butanone	5.00 - 5.00	0 / 5	--	--	2.50	0.0
2-Hexanone	5.00 - 5.00	0 / 7	--	--	2.50	0.0
4-Methyl-2-pentanone	5.00 - 5.00	0 / 7	--	--	2.50	0.0
Acetone	5.00 - 5.00	1 / 2	4.00	SJS05-SW04-001	3.25	1.06
Benzene	1.00 - 1.00	0 / 7	--	--	0.50	0.0
Bromochloromethane	1.00 - 1.00	0 / 7	--	--	0.50	0.0
Bromodichloromethane	1.00 - 1.00	0 / 7	--	--	0.50	0.0
Bromoform	1.00 - 1.00	0 / 7	--	--	0.50	0.0
Bromomethane	1.00 - 1.00	0 / 7	--	--	0.50	0.0
Carbon disulfide	1.00 - 1.00	4 / 7	11.5	SJS05-SW06-001	2.45	4.03
Carbon tetrachloride	1.00 - 1.00	0 / 7	--	--	0.50	0.0
Chlorobenzene	1.00 - 1.00	0 / 7	--	--	0.50	0.0
Chloroethane	1.00 - 1.00	0 / 7	--	--	0.50	0.0
Chloroform	1.00 - 1.00	0 / 7	--	--	0.50	0.0
Chloromethane	1.00 - 1.00	0 / 7	--	--	0.50	0.0

Table 5-13
Site 5/6 - Summary Statistics - Surface Water
St. Juliens Creek, Chesapeake, Virginia

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Dibromochloromethane	1.00 - 1.00	0 / 7	--	--	0.50	0.0
Ethylbenzene	1.00 - 1.00	0 / 7	--	--	0.50	0.0
Methylene chloride	2.00 - 2.00	0 / 7	--	--	0.46	0.26
Styrene	1.00 - 1.00	0 / 7	--	--	0.50	0.0
Tetrachloroethene	1.00 - 1.00	0 / 7	--	--	0.50	0.0
Toluene	1.00 - 1.00	1 / 7	0.50	SJS05-SW04-001	0.46	0.073
Trichloroethene	1.00 - 1.00	0 / 6	--	--	0.50	0.0
Vinyl chloride	1.00 - 1.00	0 / 7	--	--	0.50	0.0
Xylene, total	1.00 - 1.00	1 / 7	0.30	SJS05-SW04-001	0.47	0.076
cis-1,2-Dichloroethene	1.00 - 1.00	0 / 7	--	--	0.50	0.0
cis-1,3-Dichloropropene	1.00 - 1.00	0 / 7	--	--	0.50	0.0
trans-1,2-Dichloroethene	1.00 - 1.00	0 / 7	--	--	0.50	0.0
trans-1,3-Dichloropropene	1.00 - 1.00	0 / 7	--	--	0.50	0.0
Other Parameters (MG/L)						
Hardness	1.00 - 2.00	6 / 6	583	SJS05-SW05-001	395	155
Phosphate	0.020 - 0.20	4 / 6	1.15	SJS05-SW05-001	0.35	0.48

Table 5-14
Surface Soil Screening Statisitcs - Step 2
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Inorganics (MG/KG)								
Aluminum	5.80 - 92.0	66 / 66	22,200	SJS05-SS49-00-03D	1.00	66 / 66	22,200	YES
Antimony	0.31 - 28.0	25 / 51	56.5	SJS05-SS44-00-03D	0.48	25 / 51	118	YES
Arsenic	0.30 - 4.60	66 / 66	152	SJS05-SS11-000	328	0 / 66	0.46	NO
Barium	0.030 - 92.0	66 / 66	23,900	SJS05-SS36-000	440	13 / 66	54.3	YES
Beryllium	0.020 - 2.30	66 / 66	1.30	SJS05-SS18-000	0.020	66 / 66	65.0	YES
Cadmium	0.050 - 2.30	47 / 66	47.8	SJS05-SS38-000	2.50	10 / 66	19.1	YES
Calcium [2]	8.80 - 5,500	66 / 66	165,000	SJS05-SS51-00-03D	NSV	-- / --	NSV	NO
Chromium	0.17 - 4.60	66 / 66	867	SJS05-SS19-000	0.0075	66 / 66	115,600	YES
Cobalt	0.080 - 23.0	64 / 66	17.7	SJS05-SS01-000	100	0 / 66	0.18	NO
Copper	0.17 - 320	66 / 66	209,000	SJS05-SS44-00-03D	15.0	53 / 66	13,933	YES
Cyanide	0.17 - 1.10	18 / 59	5.20	SJS05-SS51-00-03D	0.0050	18 / 59	1,040	YES
Iron	2.66 - 46.0	66 / 66	120,000	SJS05-SS01-000	12.0	66 / 66	10,000	YES
Lead	0.15 - 1.40	66 / 66	7,210	SJS05-SS01-000	0.010	66 / 66	721,000	YES
Magnesium [2]	3.70 - 2,300	66 / 66	9,820	SJS05-SS36-000	NSV	-- / --	NSV	NO
Manganese	0.050 - 6.90	66 / 66	1,870	SJS05-SS36-000	330	9 / 66	5.67	YES
Mercury	0.0100 - 0.24	58 / 65	1.10	SJS05-SS33-000	0.058	53 / 65	19.0	YES
Nickel	0.14 - 18.0	65 / 66	198	SJS05-SS44-00-03D	2.00	62 / 66	99.0	YES
Potassium [2]	2.00 - 2,300	60 / 66	4,430	SJS05-SS35-000	NSV	-- / --	NSV	NO
Selenium	0.40 - 2.30	13 / 66	6.10	SJS05-SS44-00-03D	1.80	2 / 66	3.39	YES
Silver	0.14 - 4.60	33 / 66	23.4	SJS05-SS66-00-03D	9.80E-06	33 / 66	2,387,755	YES
Sodium [2]	9.07 - 2,300	38 / 66	6,410	SJS05-SS18-000	NSV	-- / --	NSV	NO
Thallium	0.31 - 4.60	19 / 66	7.70	SJS05-SS44-00-03D	0.0010	19 / 66	7,700	YES
Vanadium	0.090 - 23.0	66 / 66	69.1	SJS05-SS35-000	0.50	66 / 66	138	YES
Zinc	0.29 - 260	66 / 66	124,000	SJS05-SS44-00-03D	10.0	66 / 66	12,400	YES
Pesticide/Polychlorinated Biphenyls (UG/KG)								
4,4'-DDD	3.30 - 57.0	43 / 61	310	SJS05-SS09-000	100	1 / 61	3.10	YES
4,4'-DDE	3.30 - 600	59 / 62	4,700	SJS05-SS35-000	100	27 / 62	47.0	YES
4,4'-DDT	3.30 - 600	56 / 62	3,100	SJS05-SS32-000	100	16 / 62	31.0	YES
Aldrin	1.70 - 29.0	0 / 62	--	--	100	-- / --	0.29	NO
Aroclor-1016	33.0 - 370	0 / 34	--	--	100	-- / --	3.70	YES
Aroclor-1221	67.0 - 760	0 / 34	--	--	100	-- / --	7.60	YES
Aroclor-1232	33.0 - 370	0 / 34	--	--	100	-- / --	3.70	YES
Aroclor-1242	33.0 - 370	0 / 34	--	--	100	-- / --	3.70	YES
Aroclor-1248	33.0 - 370	0 / 34	--	--	100	-- / --	3.70	YES

NSV - No Screening Value
1 - Shaded cells indicate hazard quotient based on reporting limits
2 - Macronutrient - Not considered to be a COPC

Table 5-14
Surface Soil Screening Statisitcs - Step 2
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Aroclor-1254	33.0 - 370	0 / 34	--	--	100	-- / --	3.70	YES
Aroclor-1260	33.0 - 370	2 / 34	39.0	SJS05-SS08-000	100	0 / 34	0.39	NO
Dieldrin	3.30 - 57.0	3 / 62	6.80	SJS05-SS08-000	100	0 / 62	0.068	NO
Endosulfan I	1.70 - 29.0	0 / 62	--	--	NSV	-- / --	NSV	NO
Endosulfan II	3.30 - 57.0	0 / 62	--	--	NSV	-- / --	NSV	NO
Endosulfan sulfate	3.30 - 57.0	4 / 62	11.0	SJS05-SS53-00-03D	NSV	-- / --	NSV	YES
Endrin	3.30 - 57.0	0 / 62	--	--	100	-- / --	0.57	NO
Endrin aldehyde	3.30 - 57.0	0 / 62	--	--	100	-- / --	0.57	NO
Endrin ketone	3.30 - 57.0	3 / 62	20.0	SJS05-SS53-00-03D	100	0 / 62	0.20	NO
Heptachlor	1.70 - 29.0	0 / 62	--	--	NSV	-- / --	NSV	NO
Heptachlor epoxide	1.70 - 29.0	0 / 62	--	--	100	-- / --	0.29	NO
Methoxychlor	17.0 - 290	0 / 62	--	--	100	-- / --	2.90	YES
Toxaphene	170 - 2,900	0 / 62	--	--	NSV	-- / --	NSV	NO
alpha-BHC	1.70 - 29.0	1 / 62	3.50	SJS05-SS08-000	100,000	0 / 62	3.50E-05	NO
alpha-Chlordane	1.70 - 29.0	3 / 62	2.40	SJS05-SS08-000	100	0 / 62	0.024	NO
beta-BHC	1.70 - 29.0	0 / 62	--	--	100,000	-- / --	2.90E-04	NO
delta-BHC	1.70 - 29.0	0 / 62	--	--	100,000	-- / --	2.90E-04	NO
gamma-BHC (Lindane)	1.70 - 29.0	0 / 62	--	--	100	-- / --	0.29	NO
gamma-Chlordane	1.70 - 29.0	1 / 62	2.60	SJS05-SS08-000	NSV	-- / --	NSV	YES
Semivolatile Organic Compounds (UG/KG)								
1,1-Biphenyl	420 - 450	0 / 4	--	--	600	-- / --	0.75	NO
1,2,4-Trichlorobenzene	330 - 2,000	0 / 34	--	--	100	-- / --	20.0	YES
1,2-Dichlorobenzene	330 - 2,000	0 / 34	--	--	100	-- / --	20.0	YES
1,3-Dichlorobenzene	330 - 2,000	0 / 34	--	--	NSV	-- / --	NSV	NO
1,4-Dichlorobenzene	330 - 2,000	0 / 34	--	--	100	-- / --	20.0	YES
2,4,5-Trichlorophenol	830 - 5,000	0 / 38	--	--	100	-- / --	50.0	YES
2,4,6-Trichlorophenol	330 - 2,000	0 / 38	--	--	100	-- / --	20.0	YES
2,4-Dichlorophenol	330 - 2,000	0 / 38	--	--	100	-- / --	20.0	YES
2,4-Dimethylphenol	330 - 2,000	0 / 38	--	--	100	-- / --	20.0	YES
2,4-Dinitrophenol	830 - 2,000	0 / 38	--	--	100	-- / --	20.0	YES
2,4-Dinitrotoluene	330 - 2,000	8 / 38	3,200	SJS05-SS03-000	NSV	-- / --	NSV	YES
2,6-Dinitrotoluene	330 - 2,000	1 / 38	39.0	SJS05-SS01-000	NSV	-- / --	NSV	YES
2-Chloronaphthalene	330 - 2,000	0 / 38	--	--	NSV	-- / --	NSV	NO
2-Chlorophenol	330 - 2,000	0 / 38	--	--	100	-- / --	20.0	YES
2-Methylnaphthalene	330 - 2,000	2 / 66	57.0	SJS05-SS45-00-03D	NSV	-- / --	NSV	YES
2-Methylphenol	330 - 2,000	0 / 38	--	--	100	-- / --	20.0	YES

NSV - No Screening Value
1 - Shaded cells indicate hazard quotient based on reporting limits
2 - Macronutrient - Not considered to be a COPC

Table 5-14
Surface Soil Screening Statisitcs - Step 2
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
2-Nitroaniline	830 - 5,000	0 / 38	--	--	NSV	-- / --	NSV	NO
2-Nitrophenol	330 - 2,000	0 / 38	--	--	NSV	-- / --	NSV	NO
3,3'-Dichlorobenzidine	330 - 2,000	0 / 38	--	--	NSV	-- / --	NSV	NO
3-Nitroaniline	830 - 5,000	0 / 38	--	--	NSV	-- / --	NSV	NO
4,6-Dinitro-2-methylphenol	830 - 2,000	0 / 38	--	--	NSV	-- / --	NSV	NO
4-Bromophenyl-phenylether	330 - 2,000	0 / 38	--	--	NSV	-- / --	NSV	NO
4-Chloro-3-methylphenol	330 - 2,000	0 / 38	--	--	NSV	-- / --	NSV	NO
4-Chloroaniline	330 - 2,000	0 / 38	--	--	NSV	-- / --	NSV	NO
4-Chlorophenyl-phenylether	330 - 2,000	0 / 38	--	--	NSV	-- / --	NSV	NO
4-Methylphenol	330 - 2,000	0 / 38	--	--	100	-- / --	20.0	YES
4-Nitroaniline	830 - 5,000	1 / 38	460	SJS05-SS37-000	NSV	-- / --	NSV	YES
4-Nitrophenol	830 - 5,000	0 / 38	--	--	100	-- / --	50.0	YES
Acenaphthene	330 - 2,000	1 / 66	41.0	SJS05-SS04-000	100	0 / 66	0.41	NO
Acenaphthylene	330 - 2,000	17 / 66	540	SJS05-SS41-00-03D	100	8 / 66	5.40	YES
Acetophenone	420 - 450	0 / 4	--	--	NSV	-- / --	NSV	NO
Anthracene	330 - 2,000	17 / 66	450	SJS05-SS41-00-03D	100	9 / 66	4.50	YES
Atrazine	420 - 450	0 / 4	--	--	NSV	-- / --	NSV	NO
Benzaldehyde	420 - 450	0 / 4	--	--	NSV	-- / --	NSV	NO
Benzo(a)anthracene	330 - 2,000	50 / 66	1,500	SJS05-SS41-00-03D	100	33 / 66	15.0	YES
Benzo(a)pyrene	330 - 2,000	47 / 66	1,200	SJS05-SS26-000	100	34 / 66	12.0	YES
Benzo(b)fluoranthene	330 - 2,000	54 / 66	2,700	SJS05-SS41-00-03D	100	43 / 66	27.0	YES
Benzo(g,h,i)perylene	330 - 2,000	42 / 66	2,300	SJS05-SS66-00-03D	100	27 / 66	23.0	YES
Benzo(k)fluoranthene	330 - 2,000	45 / 66	820	SJS05-SS41-00-03D	100	25 / 66	8.20	YES
Bis(2-chloro-1-methylethyl) ether	330 - 2,000	0 / 38	--	--	NSV	-- / --	NSV	NO
Butylbenzylphthalate	330 - 2,000	0 / 38	--	--	NSV	-- / --	NSV	NO
Caprolactam	420 - 450	0 / 4	--	--	NSV	-- / --	NSV	NO
Carbazole	330 - 2,000	4 / 38	69.0	SJS05-SS26-000	NSV	-- / --	NSV	YES
Chrysene	330 - 2,000	53 / 66	2,200	SJS05-SS41-00-03D	100	39 / 66	22.0	YES
Di-n-butylphthalate	330 - 2,000	14 / 38	4,700	SJS05-SS03-000	200,000	0 / 38	0.024	NO
Di-n-octylphthalate	330 - 2,000	0 / 38	--	--	NSV	-- / --	NSV	NO
Dibenz(a,h)anthracene	330 - 2,000	16 / 66	560	SJS05-SS66-00-03D	100	9 / 66	5.60	YES
Dibenzofuran	330 - 2,000	0 / 66	--	--	NSV	-- / --	NSV	NO
Diethylphthalate	330 - 2,000	1 / 38	170	SJS05-SS12-000	1,000	0 / 38	0.17	NO
Dimethyl phthalate	330 - 2,000	1 / 38	63.0	SJS05-SS12-000	2,000	0 / 38	0.032	NO
Fluoranthene	330 - 2,000	52 / 66	2,000	SJS05-SS03-000	100	41 / 66	20.0	YES
Fluorene	330 - 2,000	0 / 66	--	--	100	-- / --	20.0	YES

NSV - No Screening Value
1 - Shaded cells indicate hazard quotient based on reporting limits
2 - Macronutrient - Not considered to be a COPC

Table 5-14
Surface Soil Screening Statisitcs - Step 2
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Hexachlorobenzene	330 - 2,000	0 / 38	--	--	1,000,000	-- / --	0.0020	NO
Hexachlorobutadiene	330 - 2,000	0 / 38	--	--	NSV	-- / --	NSV	NO
Hexachlorocyclopentadiene	330 - 2,000	0 / 38	--	--	100	-- / --	20.0	YES
Hexachloroethane	330 - 2,000	0 / 38	--	--	NSV	-- / --	NSV	NO
Indeno(1,2,3-cd)pyrene	330 - 2,000	46 / 66	1,600	SJS05-SS66-00-03D	100	28 / 66	16.0	YES
Isophorone	330 - 2,000	0 / 38	--	--	NSV	-- / --	NSV	NO
Naphthalene	330 - 2,000	6 / 66	90.0	SJS05-SS35-000	100	0 / 66	0.90	NO
Nitrobenzene	330 - 2,000	0 / 38	--	--	400	-- / --	5.00	YES
Pentachlorophenol	830 - 5,000	0 / 38	--	--	100	-- / --	50.0	YES
Phenanthrene	330 - 2,000	38 / 66	390	SJS05-SS41-00-03D	100	21 / 66	3.90	YES
Phenol	330 - 2,000	0 / 38	--	--	100	-- / --	20.0	YES
Pyrene	330 - 2,000	53 / 66	1,300	SJS05-SS26-000	100	38 / 66	13.0	YES
bis(2-Chloroethoxy)methane	330 - 2,000	0 / 38	--	--	NSV	-- / --	NSV	NO
bis(2-Chloroethyl)ether	330 - 2,000	0 / 38	--	--	NSV	-- / --	NSV	NO
bis(2-Ethylhexyl)phthalate	280 - 2,000	4 / 38	180	SJS05-SS12-000	NSV	-- / --	NSV	YES
n-Nitroso-di-n-propylamine	330 - 2,000	0 / 38	--	--	NSV	-- / --	NSV	NO
n-Nitrosodiphenylamine	330 - 2,000	3 / 38	530	SJS05-SS03-000	200	1 / 38	2.65	YES
Explosives (UG/KG)								
1,3,5-Trinitrobenzene	227 - 540	0 / 26	--	--	NSV	-- / --	NSV	NO
1,3-Dinitrobenzene	227 - 540	0 / 26	--	--	NSV	-- / --	NSV	NO
2,4,6-Trinitrotoluene	227 - 540	0 / 26	--	--	NSV	-- / --	NSV	NO
2,4-Dinitrotoluene	227 - 540	2 / 26	638	SJS05-SS14-000	NSV	-- / --	NSV	YES
2,6-Dinitrotoluene	227 - 540	0 / 26	--	--	NSV	-- / --	NSV	NO
2-Amino-4,6-dinitrotoluene	227 - 540	1 / 26	417	SJS05-SS24-000	NSV	-- / --	NSV	YES
2-Nitrotoluene	455 - 540	0 / 26	--	--	NSV	-- / --	NSV	NO
3-Nitrotoluene	455 - 540	0 / 26	--	--	NSV	-- / --	NSV	NO
4-Amino-2,6-dinitrotoluene	227 - 540	0 / 26	--	--	NSV	-- / --	NSV	NO
4-Nitrotoluene	455 - 540	0 / 26	--	--	NSV	-- / --	NSV	NO
HMX	455 - 540	0 / 26	--	--	NSV	-- / --	NSV	NO
Nitrobenzene	227 - 540	0 / 26	--	--	400	-- / --	1.35	YES
RDX	455 - 540	0 / 26	--	--	NSV	-- / --	NSV	NO
Tetryl	455 - 540	0 / 26	--	--	NSV	-- / --	NSV	NO
Volatile Organic Compounds (UG/KG)								
1,1,1-Trichloroethane	10.0 - 22.0	0 / 34	--	--	300	-- / --	0.073	NO
1,1,2,2-Tetrachloroethane	10.0 - 22.0	0 / 34	--	--	300	-- / --	0.073	NO
1,1,2-Trichloroethane	10.0 - 22.0	0 / 34	--	--	300	-- / --	0.073	NO

NSV - No Screening Value
1 - Shaded cells indicate hazard quotient based on reporting limits
2 - Macronutrient - Not considered to be a COPC

Table 5-14
Surface Soil Screening Statisitcs - Step 2
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
1,1-Dichloroethane	10.0 - 22.0	0 / 34	--	--	300	-- / --	0.073	NO
1,1-Dichloroethene	10.0 - 22.0	0 / 34	--	--	NSV	-- / --	NSV	NO
1,2-Dichloroethane	10.0 - 22.0	0 / 34	--	--	870,000	-- / --	2.53E-05	NO
1,2-Dichloroethene (total)	10.0 - 22.0	1 / 34	1.00	SJS05-SS08-000	NSV	-- / --	NSV	YES
1,2-Dichloropropane	10.0 - 22.0	0 / 34	--	--	300	-- / --	0.073	NO
2-Butanone	10.0 - 22.0	2 / 34	210	SJS05-SS06-000	NSV	-- / --	NSV	YES
2-Hexanone	10.0 - 22.0	0 / 34	--	--	NSV	-- / --	NSV	NO
4-Methyl-2-pentanone	10.0 - 22.0	0 / 34	--	--	100,000	-- / --	2.20E-04	NO
Acetone	10.0 - 22.0	11 / 34	62.0	SJS05-SS14-000	NSV	-- / --	NSV	YES
Benzene	10.0 - 22.0	0 / 34	--	--	100	-- / --	0.22	NO
Bromodichloromethane	10.0 - 22.0	0 / 34	--	--	450,000	-- / --	4.89E-05	NO
Bromoform	10.0 - 22.0	0 / 34	--	--	1,147,000	-- / --	1.92E-05	NO
Bromomethane	10.0 - 22.0	0 / 34	--	--	NSV	-- / --	NSV	NO
Carbon disulfide	10.0 - 22.0	0 / 34	--	--	NSV	-- / --	NSV	NO
Carbon tetrachloride	10.0 - 22.0	0 / 34	--	--	300	-- / --	0.073	NO
Chlorobenzene	10.0 - 22.0	0 / 34	--	--	100	-- / --	0.22	NO
Chloroethane	10.0 - 22.0	0 / 34	--	--	NSV	-- / --	NSV	NO
Chloroform	10.0 - 22.0	1 / 34	2.00	SJS05-SS26-000	300	0 / 34	0.0067	NO
Chloromethane	10.0 - 22.0	2 / 34	5.00	SJS05-SS26-000	NSV	-- / --	NSV	YES
Dibromochloromethane	10.0 - 22.0	0 / 34	--	--	NSV	-- / --	NSV	NO
Ethylbenzene	10.0 - 22.0	0 / 34	--	--	100	-- / --	0.22	NO
Methylene chloride	10.0 - 22.0	10 / 34	171	SJS05-SS12-000	300	0 / 34	0.57	NO
Styrene	10.0 - 22.0	1 / 34	29.0	SJS05-SS34-000	100	0 / 34	0.29	NO
Tetrachloroethene	10.0 - 22.0	3 / 34	4.00	SJS05-SS09-000	300	0 / 34	0.013	NO
Toluene	10.0 - 22.0	5 / 34	5.00	SJS05-SS09-000	100	0 / 34	0.050	NO
Trichloroethene	10.0 - 22.0	10 / 34	58.0	SJS05-SS27-000	300	0 / 34	0.19	NO
Vinyl chloride	10.0 - 22.0	0 / 34	--	--	300	-- / --	0.073	NO
Xylene, total	10.0 - 22.0	2 / 34	3.00	SJS05-SS05-000	100	0 / 34	0.030	NO
cis-1,3-Dichloropropene	10.0 - 22.0	0 / 34	--	--	300	-- / --	0.073	NO
trans-1,3-Dichloropropene	10.0 - 22.0	0 / 34	--	--	300	-- / --	0.073	NO
Dioxin/Furans (UG/KG)								
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	3.60E-04 - 3.90E-04	4 / 4	0.18	SJS05-SS50-00-03D	NSV	-- / --	NSV	YES
1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.40E-04 - 3.10E-04	4 / 4	0.084	SJS05-SS44-00-03D	NSV	-- / --	NSV	YES
1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.90E-04 - 3.30E-04	2 / 4	0.0077	SJS05-SS44-00-03D	NSV	-- / --	NSV	YES
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	1.50E-04 - 3.70E-04	4 / 4	0.0059	SJS05-SS50-00-03D	NSV	-- / --	NSV	YES
1,2,3,4,7,8-Hexachlorodibenzofuran	1.10E-04 - 2.60E-04	4 / 4	0.035	SJS05-SS44-00-03D	NSV	-- / --	NSV	YES

NSV - No Screening Value
1 - Shaded cells indicate hazard quotient based on reporting limits
2 - Macronutrient - Not considered to be a COPC

Table 5-14
Surface Soil Screening Statisitcs - Step 2
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	1.70E-04 - 4.10E-04	4 / 4	0.0091	SJS05-SS50-00-03D	NSV	-- / --	NSV	YES
1,2,3,6,7,8-Hexachlorodibenzofuran	1.20E-04 - 2.60E-04	4 / 4	0.013	SJS05-SS44-00-03D	NSV	-- / --	NSV	YES
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	1.50E-04 - 3.70E-04	4 / 4	0.017	SJS05-SS50-00-03D	NSV	-- / --	NSV	YES
1,2,3,7,8,9-Hexachlorodibenzofuran	1.40E-04 - 2.40E-04	1 / 4	9.00E-04	SJS05-SS44-00-03D	NSV	-- / --	NSV	YES
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	1.90E-04 - 4.10E-04	4 / 4	0.0044	SJS05-SS50-00-03D	NSV	-- / --	NSV	YES
1,2,3,7,8-Pentachlorodibenzofuran	2.00E-04 - 4.20E-04	4 / 4	0.0073	SJS05-SS44-00-03D	NSV	-- / --	NSV	YES
2,3,4,6,7,8-Hexachlorodibenzofuran	1.20E-04 - 1.70E-04	4 / 4	0.019	SJS05-SS44-00-03D	NSV	-- / --	NSV	YES
2,3,4,7,8-Pentachlorodibenzofuran	1.50E-04 - 2.30E-04	4 / 4	0.011	SJS05-SS44-00-03D	NSV	-- / --	NSV	YES
2,3,7,8-TCDD (dioxin)	4.00E-04 - 0.0013	0 / 4	--	--	NSV	-- / --	NSV	NO
2,3,7,8-Tetrachlorodibenzofuran	3.50E-04 - 7.80E-04	4 / 4	0.0096	SJS05-SS66-00-03D	NSV	-- / --	NSV	YES
Octachlorodibenzo-p-dioxin	2.50E-04 - 4.80E-04	4 / 4	2.40	SJS05-SS50-00-03D	NSV	-- / --	NSV	YES
Octachlorodibenzofuran	1.80E-04 - 3.00E-04	4 / 4	0.10	SJS05-SS44-00-03D	NSV	-- / --	NSV	YES

NSV - No Screening Value
1 - Shaded cells indicate hazard quotient based on reporting limits
2 - Macronutrient - Not considered to be a COPC

Table 5-15
Summary of Hazard Quotients for Food Web Exposure - Step 2
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Chemical	Short-tailed shrew		Deer mouse		Red fox		American robin		American woodcock		Red-tailed hawk	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Inorganics												
Arsenic	70.18	14.04	44.25	8.85	2.15	0.43	7.10	2.37	7.95	2.65	0.40	0.13
Cadmium	230.30	23.03	54.31	5.43	11.75	2.35	74.87	5.43	243.21	17.63	3.78	0.27
Chromium	102.71	20.54	21.90	4.38	5.15	1.03	147.65	29.53	513.15	102.63	11.99	2.40
Copper	539.88	404.91	154.66	116.00	815.03	629.85	535.08	407.60	1322.29	1007.25	180.78	137.71
Lead	391.80	39.18	241.39	24.14	91.51	9.15	456.93	91.39	752.24	150.45	108.75	21.75
Mercury	85.57	17.11	23.68	4.74	0.46	0.28	3.06	1.25	8.43	3.44	0.03	0.01
Nickel	5.05	2.53	2.79	1.39	1.59	0.64	1.48	1.07	2.75	1.99	0.30	0.22
Selenium	11.47	6.95	8.79	5.33	3.91	2.37	4.95	1.45	4.77	1.40	1.19	0.35
Silver	4.70	0.94	1.02	0.20	0.11	0.02	2.64	0.53	9.34	1.87	0.07	0.01
Zinc	1198.62	599.31	299.56	149.78	819.71	163.94	6603.07	730.87	20113.13	2226.26	965.12	106.83
Pesticides/PCBs												
4,4'-DDD	0.10	0.02	0.02	<0.01	<0.01	<0.01	0.07	<0.01	0.24	0.02	0.05	0.01
4,4'-DDE	7.37	1.47	1.56	0.31	0.38	0.08	5.09	0.51	18.18	1.82	3.88	0.78
4,4'-DDT	0.39	0.08	0.07	0.01	0.02	<0.01	0.26	0.03	0.91	0.09	0.21	0.04
Aldrin	0.06	0.01	0.01	<0.01	<0.01	<0.01	0.07	0.01	0.26	0.05	<0.01	<0.01
alpha-BHC	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
alpha-Chlordane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aroclor-1016	5.10	1.02	1.08	0.22	0.03	0.01	0.73	0.15	2.61	0.52	0.09	0.02
Aroclor-1221	10.48	2.10	2.23	0.45	0.66	0.13	1.51	0.30	5.36	1.07	0.18	0.04
Aroclor-1232	5.10	1.02	1.08	0.22	0.32	0.06	0.73	0.15	2.61	0.52	0.09	0.02
Aroclor-1242	5.10	1.02	1.08	0.22	0.32	0.06	0.73	0.15	2.61	0.52	0.09	0.02
Aroclor-1248	5.10	1.02	1.08	0.22	0.32	0.06	0.73	0.15	2.61	0.52	0.09	0.02
Aroclor-1254	5.10	1.02	1.08	0.22	0.32	0.06	0.73	0.15	2.61	0.52	0.09	0.02
Aroclor-1260	0.54	0.11	0.12	0.02	0.03	<0.01	0.08	0.02	0.28	0.06	<0.01	<0.01
beta-BHC	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
delta-BHC	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
Dieldrin	0.16	0.03	0.04	<0.01	0.02	<0.01	0.04	<0.01	0.13	0.03	<0.01	<0.01
Endosulfan I	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Endosulfan II	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Endrin	0.14	0.03	0.04	<0.01	0.01	<0.01	0.67	0.13	1.91	0.38	0.08	0.02
gamma-BHC (Lindane)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
gamma-Chlordane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Heptachlor	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	0.06	0.01	<0.01	<0.01
Heptachlor epoxide	0.09	0.02	0.02	<0.01	<0.01	<0.01	0.05	<0.01	0.16	0.03	<0.01	<0.01
Methoxychlor	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Toxaphene	0.05	<0.01	0.01	<0.01	<0.01	<0.01	0.18	0.04	0.58	0.12	0.02	<0.01

Table 5-15
Summary of Hazard Quotients for Food Web Exposure - Step 2
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Semivolatile Organics												
1,2,4-Trichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,2-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
1,3-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
1,4-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)anthracene	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01
Benzo(a)pyrene	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene	0.06	0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene	0.08	0.02	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01
Fluorene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01
Hexachlorobenzene	0.44	0.22	0.09	0.05	0.03	<0.01	1.66	0.33	5.79	1.16	0.22	0.04
Hexachlorobutadiene	0.14	0.01	0.03	<0.01	0.01	<0.01	0.04	<0.01	0.12	0.02	<0.01	<0.01
Hexachlorocyclopentadiene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA
Hexachloroethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	0.06	0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01
Pentachlorophenol	0.95	0.19	0.20	0.04	0.06	0.01	0.48	0.24	1.72	0.86	0.06	0.03
Phenanthrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pyrene	0.04	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01
Volatile Organics												
1,1,2,2-Tetrachloroethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA
Dioxin/Furans												
Dioxin/furan (TEQ)	53.70	5.37	11.38	1.14	2.47	0.25	2.52	0.25	9.01	0.90	0.20	0.02

Table 5-16
Surface Soil Screening Statisitcs - Step 3
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient[1]	COPC?
Inorganics (MG/KG)									
Aluminum	5.80 - 92.0	66 / 66	22,200	SJS05-SS49-00-03D	8,856	1.00	66 / 66	8,856	YES
Antimony	0.31 - 28.0	25 / 51	56.5	SJS05-SS44-00-03D	4.50	0.48	25 / 51	9.38	YES
Barium	0.030 - 92.0	66 / 66	23,900	SJS05-SS36-000	987	440	13 / 66	2.24	YES
Beryllium	0.020 - 2.30	66 / 66	1.30	SJS05-SS18-000	0.40	0.020	66 / 66	20.0	YES
Cadmium	0.050 - 2.30	47 / 66	47.8	SJS05-SS38-000	2.22	2.50	10 / 66	0.89	NO
Chromium	0.17 - 4.60	66 / 66	867	SJS05-SS19-000	35.2	0.0075	66 / 66	4,696	YES
Copper	0.17 - 320	66 / 66	209,000	SJS05-SS44-00-03D	4,865	15.0	53 / 66	324	YES
Cyanide	0.17 - 1.10	18 / 59	5.20	SJS05-SS51-00-03D	0.33	0.0050	18 / 59	66.7	YES
Iron	2.66 - 46.0	66 / 66	120,000	SJS05-SS01-000	20,488	12.0	66 / 66	1,707	YES
Lead	0.15 - 1.40	66 / 66	7,210	SJS05-SS01-000	505	0.010	66 / 66	50,496	YES
Manganese	0.050 - 6.90	66 / 66	1,870	SJS05-SS36-000	206	330	9 / 66	0.62	NO
Mercury	0.0100 - 0.24	58 / 65	1.10	SJS05-SS33-000	0.24	0.058	53 / 65	4.20	YES
Nickel	0.14 - 18.0	65 / 66	198	SJS05-SS44-00-03D	15.2	2.00	62 / 66	7.60	YES
Selenium	0.40 - 2.30	13 / 66	6.10	SJS05-SS44-00-03D	0.56	1.80	2 / 66	0.31	NO
Silver	0.14 - 4.60	33 / 66	23.4	SJS05-SS66-00-03D	1.74	9.80E-06	33 / 66	177,365	YES
Thallium	0.31 - 4.60	19 / 66	7.70	SJS05-SS44-00-03D	0.78	0.0010	19 / 66	777	YES
Vanadium	0.090 - 23.0	66 / 66	69.1	SJS05-SS35-000	29.6	0.50	66 / 66	59.2	YES
Zinc	0.29 - 260	66 / 66	124,000	SJS05-SS44-00-03D	2,540	10.0	66 / 66	254	YES
Pesticide/Polychlorinated Biphenyls (UG/KG)									
4,4'-DDD	3.30 - 57.0	43 / 61	310	SJS05-SS09-000	15.5	100	1 / 61	0.15	NO
4,4'-DDE	3.30 - 600	59 / 62	4,700	SJS05-SS35-000	283	100	27 / 62	2.83	YES
4,4'-DDT	3.30 - 600	56 / 62	3,100	SJS05-SS32-000	203	100	16 / 62	2.03	YES
Aroclor-1016	33.0 - 370	0 / 34	--	--	26.8	100	-- / --	0.27	NO
Aroclor-1221	67.0 - 760	0 / 34	--	--	54.3	100	-- / --	0.54	NO
Aroclor-1232	33.0 - 370	0 / 34	--	--	26.8	100	-- / --	0.27	NO
Aroclor-1242	33.0 - 370	0 / 34	--	--	26.8	100	-- / --	0.27	NO
Aroclor-1248	33.0 - 370	0 / 34	--	--	26.8	100	-- / --	0.27	NO
Aroclor-1254	33.0 - 370	0 / 34	--	--	26.8	100	-- / --	0.27	NO
Endosulfan sulfate	3.30 - 57.0	4 / 62	11.0	SJS05-SS53-00-03D	3.69	NSV	-- / --	NSV	YES

NSV - No Screening Value
1 - Shaded cells indicate hazard quotient based on reporting limits

Table 5-16
Surface Soil Screening Statisitcs - Step 3
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient[1]	COPC?
Methoxychlor	17.0 - 290	0 / 62	--	--	17.0	100	-- / --	0.17	NO
gamma-Chlordane	1.70 - 29.0	1 / 62	2.60	SJS05-SS08-000	1.73	NSV	-- / --	NSV	YES
Semivolatile Organic Compounds (UG/KG)									
1,2,4-Trichlorobenzene	330 - 2,000	0 / 34	--	--	244	100	-- / --	2.44	(YES)
1,2-Dichlorobenzene	330 - 2,000	0 / 34	--	--	244	100	-- / --	2.44	(YES)
1,4-Dichlorobenzene	330 - 2,000	0 / 34	--	--	244	100	-- / --	2.44	(YES)
2,4,5-Trichlorophenol	830 - 5,000	0 / 38	--	--	603	100	-- / --	6.03	(YES)
2,4,6-Trichlorophenol	330 - 2,000	0 / 38	--	--	241	100	-- / --	2.41	(YES)
2,4-Dichlorophenol	330 - 2,000	0 / 38	--	--	241	100	-- / --	2.41	(YES)
2,4-Dimethylphenol	330 - 2,000	0 / 38	--	--	241	100	-- / --	2.41	(YES)
2,4-Dinitrophenol	830 - 2,000	0 / 38	--	--	563	100	-- / --	5.63	(YES)
2,4-Dinitrotoluene	330 - 2,000	8 / 38	3,200	SJS05-SS03-000	307	NSV	-- / --	NSV	YES
2,6-Dinitrotoluene	330 - 2,000	1 / 38	39.0	SJS05-SS01-000	238	NSV	-- / --	NSV	YES
2-Chlorophenol	330 - 2,000	0 / 38	--	--	241	100	-- / --	2.41	(YES)
2-Methylnaphthalene	330 - 2,000	2 / 66	57.0	SJS05-SS45-00-03D	239	NSV	-- / --	NSV	YES
2-Methylphenol	330 - 2,000	0 / 38	--	--	241	100	-- / --	2.41	(YES)
4-Methylphenol	330 - 2,000	0 / 38	--	--	241	100	-- / --	2.41	(YES)
4-Nitroaniline	830 - 5,000	1 / 38	460	SJS05-SS37-000	600	NSV	-- / --	NSV	YES
4-Nitrophenol	830 - 5,000	0 / 38	--	--	603	100	-- / --	6.03	(YES)
Acenaphthylene	330 - 2,000	17 / 66	540	SJS05-SS41-00-03D	215	100	8 / 66	2.15	YES
Anthracene	330 - 2,000	17 / 66	450	SJS05-SS41-00-03D	219	100	9 / 66	2.19	YES
Benzo(a)anthracene	330 - 2,000	50 / 66	1,500	SJS05-SS41-00-03D	269	100	33 / 66	2.69	YES
Benzo(a)pyrene	330 - 2,000	47 / 66	1,200	SJS05-SS26-000	257	100	34 / 66	2.57	YES
Benzo(b)fluoranthene	330 - 2,000	54 / 66	2,700	SJS05-SS41-00-03D	486	100	43 / 66	4.86	YES
Benzo(g,h,i)perylene	330 - 2,000	42 / 66	2,300	SJS05-SS66-00-03D	242	100	27 / 66	2.42	YES
Benzo(k)fluoranthene	330 - 2,000	45 / 66	820	SJS05-SS41-00-03D	223	100	25 / 66	2.23	YES
Carbazole	330 - 2,000	4 / 38	69.0	SJS05-SS26-000	227	NSV	-- / --	NSV	YES
Chrysene	330 - 2,000	53 / 66	2,200	SJS05-SS41-00-03D	340	100	39 / 66	3.40	YES
Dibenz(a,h)anthracene	330 - 2,000	16 / 66	560	SJS05-SS66-00-03D	221	100	9 / 66	2.21	YES
Fluoranthene	330 - 2,000	52 / 66	2,000	SJS05-SS03-000	353	100	41 / 66	3.53	YES

NSV - No Screening Value
1 - Shaded cells indicate hazard quotient based on reporting limits

Table 5-16
Surface Soil Screening Statisitcs - Step 3
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient[1]	COPC?
Fluorene	330 - 2,000	0 / 66	--	--	243	100	-- / --	2.43	(YES)
Hexachlorocyclopentadiene	330 - 2,000	0 / 38	--	--	241	100	-- / --	2.41	(YES)
Indeno(1,2,3-cd)pyrene	330 - 2,000	46 / 66	1,600	SJS05-SS66-00-03D	239	100	28 / 66	2.39	YES
Nitrobenzene	330 - 2,000	0 / 38	--	--	241	400	-- / --	0.60	NO
Pentachlorophenol	830 - 5,000	0 / 38	--	--	603	100	-- / --	6.03	(YES)
Phenanthrene	330 - 2,000	38 / 66	390	SJS05-SS41-00-03D	186	100	21 / 66	1.86	YES
Phenol	330 - 2,000	0 / 38	--	--	241	100	-- / --	2.41	(YES)
Pyrene	330 - 2,000	53 / 66	1,300	SJS05-SS26-000	299	100	38 / 66	2.99	YES
bis(2-Ethylhexyl)phthalate	280 - 2,000	4 / 38	180	SJS05-SS12-000	189	NSV	-- / --	NSV	YES
n-Nitrosodiphenylamine	330 - 2,000	3 / 38	530	SJS05-SS03-000	227	200	1 / 38	1.13	YES
Explosives (UG/KG)									
2,4-Dinitrotoluene	227 - 540	2 / 26	638	SJS05-SS14-000	155	NSV	-- / --	NSV	YES
2-Amino-4,6-dinitrotoluene	227 - 540	1 / 26	417	SJS05-SS24-000	140	NSV	-- / --	NSV	YES
Nitrobenzene	227 - 540	0 / 26	--	--	128	400	-- / --	0.32	NO
Volatile Organic Compounds (UG/KG)									
1,2-Dichloroethene (total)	10.0 - 22.0	1 / 34	1.00	SJS05-SS08-000	6.43	NSV	-- / --	NSV	YES
2-Butanone	10.0 - 22.0	2 / 34	210	SJS05-SS06-000	13.2	NSV	-- / --	NSV	YES
Acetone	10.0 - 22.0	11 / 34	62.0	SJS05-SS14-000	12.7	NSV	-- / --	NSV	YES
Chloromethane	10.0 - 22.0	2 / 34	5.00	SJS05-SS26-000	6.47	NSV	-- / --	NSV	YES
Dioxin/Furans (UG/KG)									
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	3.60E-04 - 3.90E-04	4 / 4	0.18	SJS05-SS50-00-03D	0.10	NSV	-- / --	NSV	YES
1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.40E-04 - 3.10E-04	4 / 4	0.084	SJS05-SS44-00-03D	0.035	NSV	-- / --	NSV	YES
1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.90E-04 - 3.30E-04	2 / 4	0.0077	SJS05-SS44-00-03D	0.0027	NSV	-- / --	NSV	YES
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	1.50E-04 - 3.70E-04	4 / 4	0.0059	SJS05-SS50-00-03D	0.0036	NSV	-- / --	NSV	YES
1,2,3,4,7,8-Hexachlorodibenzofuran	1.10E-04 - 2.60E-04	4 / 4	0.035	SJS05-SS44-00-03D	0.012	NSV	-- / --	NSV	YES
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	1.70E-04 - 4.10E-04	4 / 4	0.0091	SJS05-SS50-00-03D	0.0065	NSV	-- / --	NSV	YES
1,2,3,6,7,8-Hexachlorodibenzofuran	1.20E-04 - 2.60E-04	4 / 4	0.013	SJS05-SS44-00-03D	0.0066	NSV	-- / --	NSV	YES
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	1.50E-04 - 3.70E-04	4 / 4	0.017	SJS05-SS50-00-03D	0.011	NSV	-- / --	NSV	YES
1,2,3,7,8,9-Hexachlorodibenzofuran	1.40E-04 - 2.40E-04	1 / 4	9.00E-04	SJS05-SS44-00-03D	3.55E-04	NSV	-- / --	NSV	YES
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	1.90E-04 - 4.10E-04	4 / 4	0.0044	SJS05-SS50-00-03D	0.0032	NSV	-- / --	NSV	YES

NSV - No Screening Value
1 - Shaded cells indicate hazard quotient based on reporting limits

Table 5-16
Surface Soil Screening Statisitcs - Step 3
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient[1]	COPC?
1,2,3,7,8-Pentachlorodibenzofuran	2.00E-04 - 4.20E-04	4 / 4	0.0073	SJS05-SS44-00-03D	0.0049	NSV	-- / --	NSV	YES
2,3,4,6,7,8-Hexachlorodibenzofuran	1.20E-04 - 1.70E-04	4 / 4	0.019	SJS05-SS44-00-03D	0.0077	NSV	-- / --	NSV	YES
2,3,4,7,8-Pentachlorodibenzofuran	1.50E-04 - 2.30E-04	4 / 4	0.011	SJS05-SS44-00-03D	0.0063	NSV	-- / --	NSV	YES
2,3,7,8-Tetrachlorodibenzofuran	3.50E-04 - 7.80E-04	4 / 4	0.0096	SJS05-SS66-00-03D	0.0056	NSV	-- / --	NSV	YES
Octachlorodibenzo-p-dioxin	2.50E-04 - 4.80E-04	4 / 4	2.40	SJS05-SS50-00-03D	1.15	NSV	-- / --	NSV	YES
Octachlorodibenzofuran	1.80E-04 - 3.00E-04	4 / 4	0.10	SJS05-SS44-00-03D	0.043	NSV	-- / --	NSV	YES

NSV - No Screening Value
1 - Shaded cells indicate hazard quotient based on reporting limits

Table 5-17
Summary of Hazard Quotients for Food Web Exposure - Step 3
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Chemical	Short-tailed shrew		Deer mouse		Red fox		American robin		American woodcock		Red-tailed hawk	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Inorganics												
Arsenic	5.11	1.02	2.76	0.55	0.26	0.05	0.28	0.09	0.42	0.14	0.08	0.03
Cadmium	1.58	0.16	0.50	0.05	0.25	0.05	0.53	0.04	1.34	0.10	0.09	<0.01
Chromium	0.46	0.09	0.13	0.03	0.07	0.01	0.70	0.14	1.74	0.35	0.18	0.04
Copper	3.00	2.25	0.66	0.49	3.58	2.77	2.44	1.86	6.42	4.89	0.84	0.64
Lead	21.22	2.12	15.74	1.57	7.57	0.76	26.27	5.25	23.70	4.74	10.42	2.08
Mercury	1.11	0.22	0.45	0.09	0.04	0.02	0.04	0.02	0.08	0.03	<0.01	<0.01
Nickel	0.44	0.22	0.32	0.16	0.24	0.10	0.13	0.10	0.13	0.09	0.05	0.04
Selenium	1.73	1.05	1.27	0.77	0.60	0.37	0.49	0.14	0.45	0.13	0.18	0.05
Silver	0.04	<0.01	0.01	<0.01	<0.01	<0.01	0.03	<0.01	0.06	0.01	<0.01	<0.01
Zinc	4.83	2.41	2.06	1.03	7.45	1.49	28.32	3.13	56.35	6.24	8.02	0.89
Pesticides/PCBs												
4,4'-DDD	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
4,4'-DDE	0.28	0.06	0.05	0.01	<0.01	<0.01	0.19	0.02	0.64	0.06	0.11	0.02
4,4'-DDT	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.03	<0.01	<0.01	<0.01
Aldrin	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
alpha-BHC	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
alpha-Chlordane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aroclor-1016	0.06	0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01
Aroclor-1221	0.13	0.03	0.03	<0.01	<0.01	<0.01	0.02	<0.01	0.06	0.01	<0.01	<0.01
Aroclor-1232	0.06	0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01
Aroclor-1242	0.06	0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01
Aroclor-1248	0.06	0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01
Aroclor-1254	0.06	0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01
Aroclor-1260	0.07	0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01
beta-BHC	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
delta-BHC	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dieldrin	0.05	0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.04	<0.01	<0.01	<0.01
Endosulfan I	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Endosulfan II	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Endrin	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	0.07	0.01	<0.01	<0.01
gamma-BHC (Lindane)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
gamma-Chlordane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Heptachlor	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Heptachlor epoxide	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Methoxychlor	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Toxaphene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01

Table 5-17
Summary of Hazard Quotients for Food Web Exposure - Step 3
Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Semivolatile Organics												
1,2,4-Trichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,2-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,3-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,4-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluorene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hexachlorobenzene	0.03	0.02	<0.01	<0.01	<0.01	<0.01	0.13	0.03	0.41	0.08	0.02	<0.01
Hexachlorobutadiene	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hexachlorocyclopentadiene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA
Hexachloroethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pentachlorophenol	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.01	0.08	0.04	<0.01	<0.01
Phenanthrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Volatile Organics												
1,1,2,2-Tetrachloroethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA
Dioxin/Furans												
Dioxin/furan (TEQ)	7.57	0.76	1.41	0.14	0.45	0.04	0.34	0.03	1.14	0.11	0.04	<0.01

Table 5-18
Summary of Step 3 COPCs [1,2]
Site 5, St. Juliens Creek, Chesapeake, Virginia

Chemicals	Direct Exposure Surface Soil	Food Web Exposure					
		Deer Mouse	Red Fox	Short-tailed Shrew	American Robin	American Woodcock	Red-tailed Hawk
Inorganics (MG/KG)	X						
Aluminum	X						
Antimony	X						
Arsenic	X			X			
Barium	X						
Beryllium	X						
Cadmium							
Chromium	X						
Cobalt	X						
Copper	X		X	X	X	X	
Cyanide	X						
Iron	X						
Lead	X	X		X	X	X	X
Manganese							
Mercury	X						
Nickel	X						
Selenium				X			
Silver	X						
Thallium	X						
Vanadium	X						
Zinc	X	X	X	X	X	X	
Pesticide/Polychlorinated Biphenyls (UG/KG)							
4,4'-DDD							
4,4'-DDE	X						
4,4'-DDT	X						
Aldrin							
Aroclor-1016							
Aroclor-1221							
Aroclor-1232							
Aroclor-1242							
Aroclor-1248							
Aroclor-1254							
Aroclor-1260							
Dieldrin							
Endosulfan I							
Endosulfan II							
Endosulfan sulfate	X[3]						
Endrin							
Endrin aldehyde							
Endrin ketone							
Heptachlor							
Heptachlor epoxide							
Methoxychlor							
Toxaphene							
alpha-BHC							
alpha-Chlordane							
beta-BHC							

1-Shaded cells indicate COPCs identified for direct exposure media and/or food web receptors
2-Blank cells denote chemicals not identified as COPCs
3-Denotes COPCs lacking a screening value

Table 5-18
Summary of Step 3 COPCs [1,2]
Site 5, St. Juliens Creek, Chesapeake, Virginia

Chemicals	Direct Exposure Surface Soil	Food Web Exposure					
		Deer Mouse	Red Fox	Short-tailed Shrew	American Robin	American Woodcock	Red-tailed Hawk
delta-BHC							
gamma-BHC (Lindane)							
gamma-Chlordane	X[3]						
Semivolatile Organic Compounds (UG/KG)							
1,1-Biphenyl							
1,2,4-Trichlorobenzene							
1,2-Dichlorobenzene							
1,3-Dichlorobenzene							
1,4-Dichlorobenzene							
2,4,5-Trichlorophenol							
2,4,6-Trichlorophenol							
2,4-Dichlorophenol							
2,4-Dimethylphenol							
2,4-Dinitrophenol							
2,4-Dinitrotoluene	X[3]						
2,6-Dinitrotoluene	X[3]						
2-Chloronaphthalene							
2-Chlorophenol							
2-Methylnaphthalene	X[3]						
2-Methylphenol							
2-Nitroaniline							
2-Nitrophenol							
3,3'-Dichlorobenzidine							
3-Nitroaniline							
4,6-Dinitro-2-methylphenol							
4-Bromophenyl-phenylether							
4-Chloro-3-methylphenol							
4-Chloroaniline							
4-Chlorophenyl-phenylether							
4-Methylphenol							
4-Nitroaniline	X[3]						
4-Nitrophenol							
Acenaphthene							
Acenaphthylene	X						
Acetophenone							
Anthracene	X						
Atrazine							
Benzaldehyde							
Benzo(a)anthracene	X						
Benzo(a)pyrene	X						
Benzo(b)fluoranthene	X						
Benzo(g,h,i)perylene	X						
Benzo(k)fluoranthene	X						
Bis(2-chloro-1-methylethyl) ether							
Butylbenzylphthalate							
Caprolactam							
Carbazole	X[3]						

1-Shaded cells indicate COPCs identified for direct exposure media and/or food web receptors
2-Blank cells denote chemicals not identified as COPCs
3-Denotes COPCs lacking a screening value

Table 5-18
Summary of Step 3 COPCs [1,2]
Site 5, St. Juliens Creek, Chesapeake, Virginia

Chemicals	Direct Exposure Surface Soil	Food Web Exposure					
		Deer Mouse	Red Fox	Short-tailed Shrew	American Robin	American Woodcock	Red-tailed Hawk
Chrysene	X						
Di-n-butylphthalate							
Di-n-octylphthalate							
Dibenz(a,h)anthracene	X						
Dibenzofuran							
Diethylphthalate							
Dimethyl phthalate							
Fluoranthene	X						
Fluorene							
Hexachlorobenzene							
Hexachlorobutadiene							
Hexachlorocyclopentadiene							
Hexachloroethane							
Indeno(1,2,3-cd)pyrene	X						
Isophorone							
Naphthalene							
Nitrobenzene							
Pentachlorophenol							
Phenanthrene							
Phenol							
Pyrene	X						
bis(2-Chloroethoxy)methane							
bis(2-Chloroethyl)ether							
bis(2-Ethylhexyl)phthalate	X[3]						
n-Nitroso-di-n-propylamine							
n-Nitrosodiphenylamine	X						
Explosives (UG/KG)							
1,3,5-Trinitrobenzene							
1,3-Dinitrobenzene							
2,4,6-Trinitrotoluene							
2,4-Dinitrotoluene	X[3]						
2,6-Dinitrotoluene							
2-Amino-4,6-dinitrotoluene	X[3]						
2-Nitrotoluene							
3-Nitrotoluene							
4-Amino-2,6-dinitrotoluene							
4-Nitrotoluene							
HMX							
Nitrobenzene							
RDX							
Tetryl							
Volatile Organic Compounds (UG/KG)							
1,1,1-Trichloroethane							
1,1,2,2-Tetrachloroethane							
1,1,2-Trichloroethane							
1,1-Dichloroethane							
1,1-Dichloroethene							

1-Shaded cells indicate COPCs identified for direct exposure media and/or food web receptors
2-Blank cells denote chemicals not identified as COPCs
3-Denotes COPCs lacking a screening value

Table 5-18
Summary of Step 3 COPCs [1,2]
Site 5, St. Juliens Creek, Chesapeake, Virginia

Chemicals	Direct Exposure Surface Soil	Food Web Exposure					
		Deer Mouse	Red Fox	Short-tailed Shrew	American Robin	American Woodcock	Red-tailed Hawk
1,2-Dichloroethane							
1,2-Dichloroethene (total)	X[3]						
1,2-Dichloropropane							
2-Butanone	X[3]						
2-Hexanone							
4-Methyl-2-pentanone							
Acetone	X[3]						
Benzene							
Bromodichloromethane							
Bromoform							
Bromomethane							
Carbon disulfide							
Carbon tetrachloride							
Chlorobenzene							
Chloroethane							
Chloroform							
Chloromethane	X[3]						
Dibromochloromethane							
Ethylbenzene							
Methylene chloride							
Styrene							
Tetrachloroethene							
Toluene							
Trichloroethene							
Vinyl chloride							
Xylene, total							
cis-1,3-Dichloropropene							
trans-1,3-Dichloropropene							
Dioxin/Furans (UG/KG)							
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	X[3]						
1,2,3,4,6,7,8-Heptachlorodibenzofuran	X[3]						
1,2,3,4,7,8,9-Heptachlorodibenzofuran	X[3]						
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	X[3]						
1,2,3,4,7,8-Hexachlorodibenzofuran	X[3]						
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	X[3]						
1,2,3,6,7,8-Hexachlorodibenzofuran	X[3]						
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	X[3]						
1,2,3,7,8,9-Hexachlorodibenzofuran	X[3]						
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	X[3]						
1,2,3,7,8-Pentachlorodibenzofuran	X[3]						
2,3,4,6,7,8-Hexachlorodibenzofuran	X[3]						
2,3,4,7,8-Pentachlorodibenzofuran	X[3]						
2,3,7,8-TCDD (dioxin)							
2,3,7,8-Tetrachlorodibenzofuran	X[3]						
Octachlorodibenzo-p-dioxin	X[3]						

1-Shaded cells indicate COPCs identified for direct exposure media and/or food web receptors
2-Blank cells denote chemicals not identified as COPCs
3-Denotes COPCs lacking a screening value

Table 5-18
Summary of Step 3 COPCs [1,2]
Site 5, St. Juliens Creek, Chesapeake, Virginia

Chemicals	Direct Exposure Surface Soil	Food Web Exposure					
		Deer Mouse	Red Fox	Short-tailed Shrew	American Robin	American Woodcock	Red-tailed Hawk
Octachlorodibenzofuran	X[3]						
Dioxin/Furans (TEQ)							

1-Shaded cells indicate COPCs identified for direct exposure media and/or food web receptors
2-Blank cells denote chemicals not identified as COPCs
3-Denotes COPCs lacking a screening value

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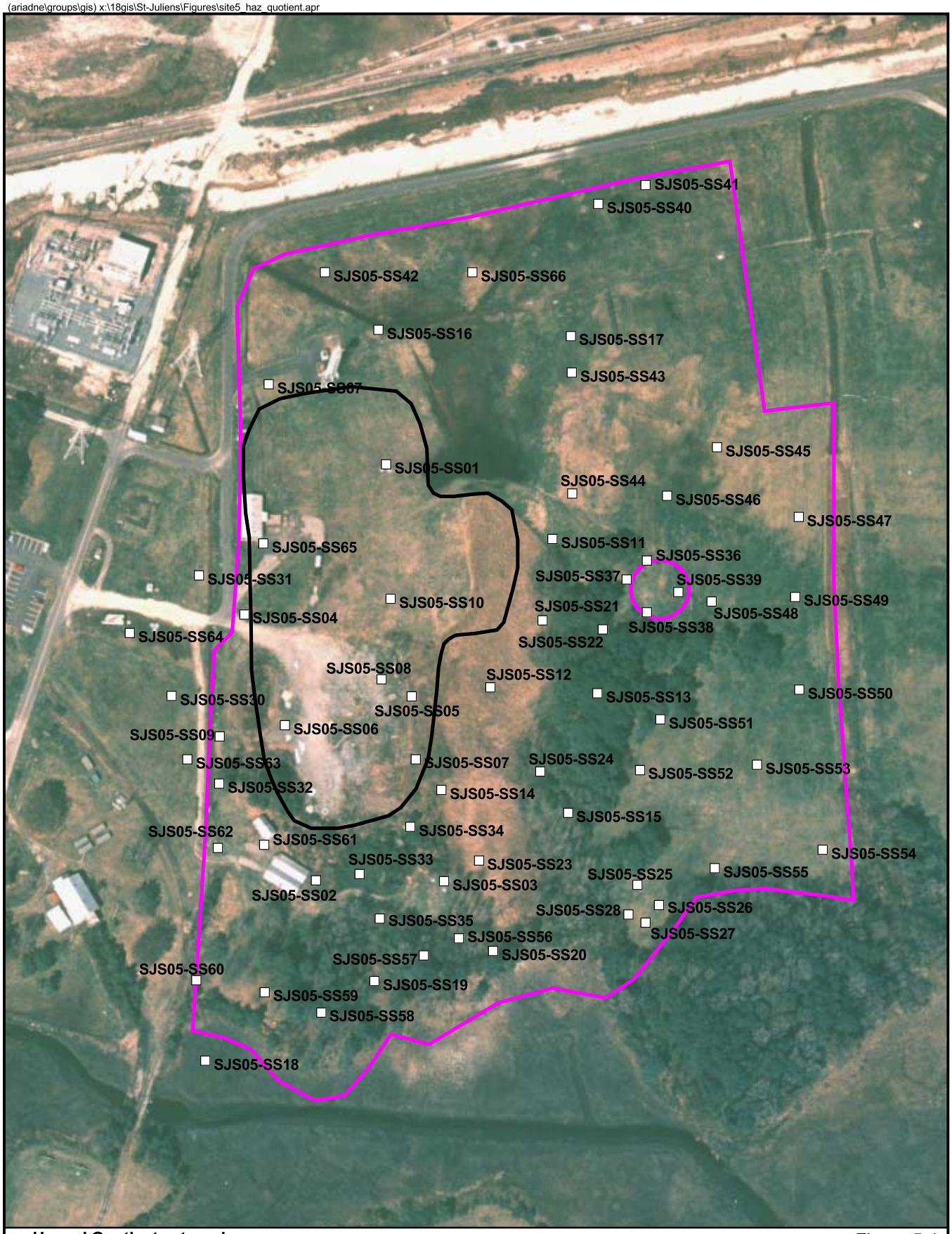

Hazard Quotient categories:

- <1
- ≥1 and <10
- ≥10 and <50
- ≥50 and <100
- ≥100

Site 5 Waste/Burnt Soil Area

Site 5 Boundary

N

0 100 200 Feet

Screening value used for Arsenic was 328 mg/kg

Figure 5-1
Spatial Distribution of COC Exceedences in Surface Soil - Arsenic
Site 5 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

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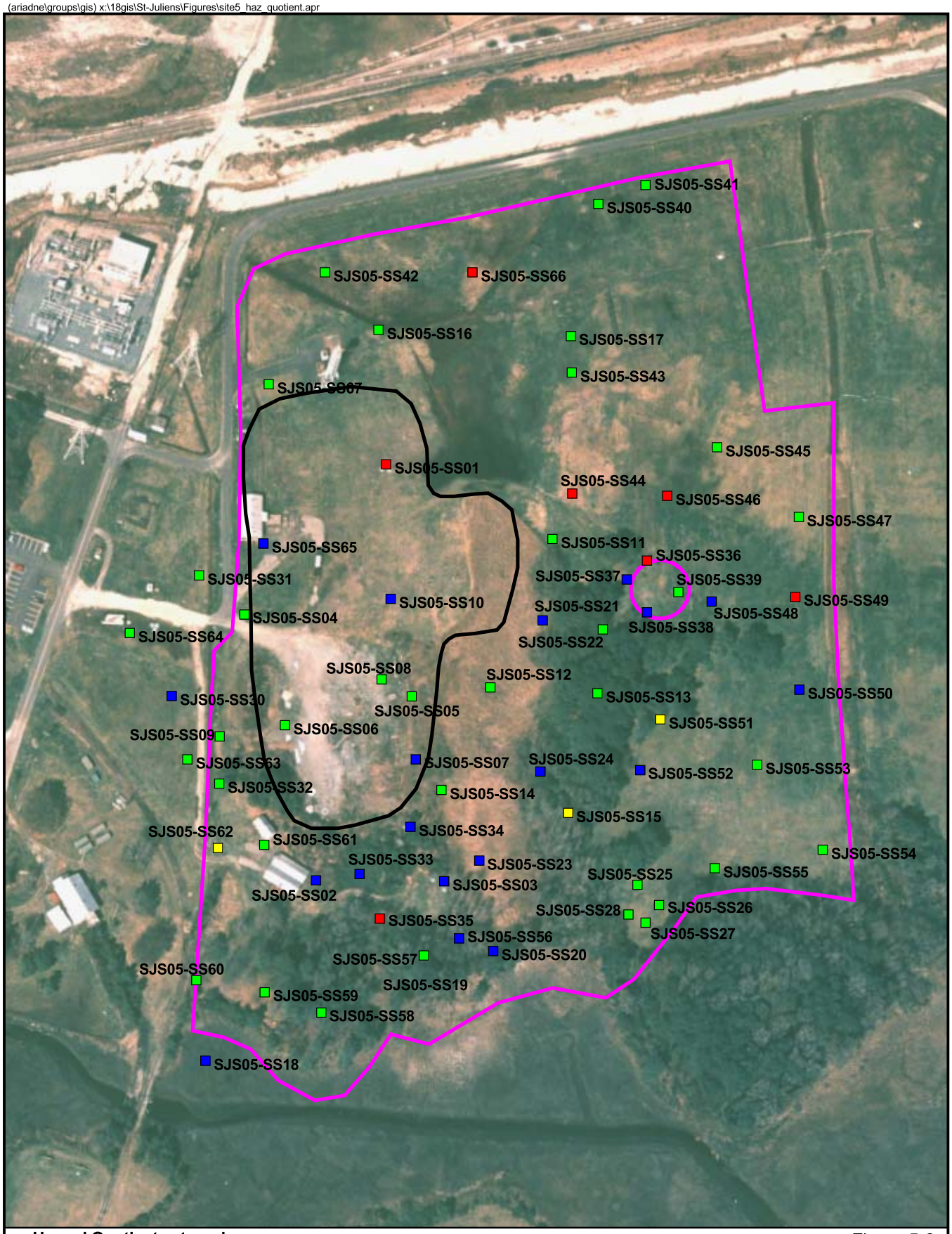

Hazard Quotient categories:

- <1
- ≥1 and <10
- ≥10 and <50
- ≥50 and <100
- ≥100

Site 5 Waste/Burnt Soil Area

Site 5 Boundary

N

0 100 200 Feet

Screening value used for Chromium was 0.4 mg/kg

Figure 5-2
Spatial Distribution of COC Exceedences
in Surface Soil - Chromium
Site 5 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

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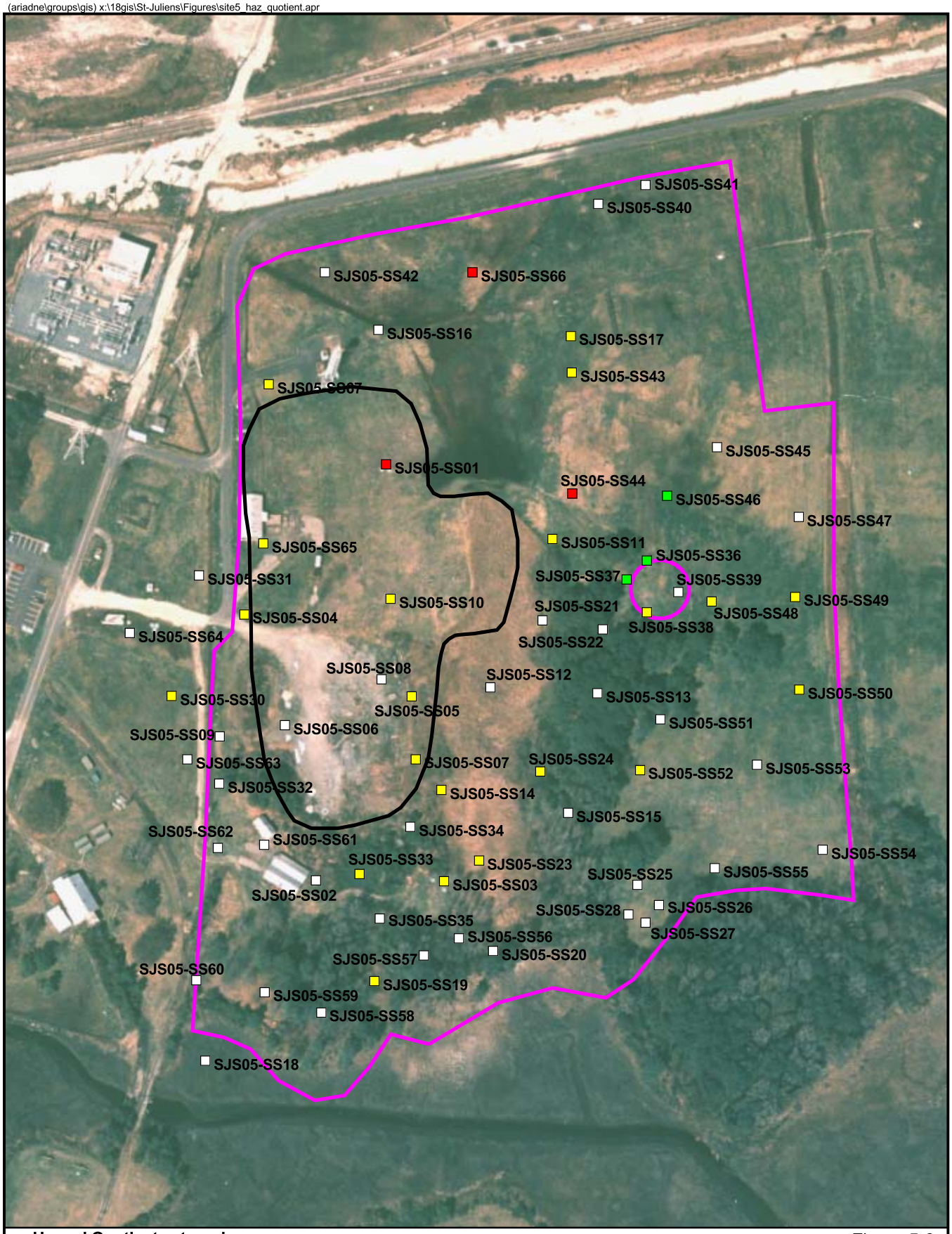

Hazard Quotient categories:

- <1
- ≥1 and <10
- ≥10 and <50
- ≥50 and <100
- ≥100

Site 5 Waste/Burnt Soil Area

Site 5 Boundary

N

0 100 200 Feet

Screening value used for Copper was 50 mg/kg

Figure 5-3
Spatial Distribution of COC Exceedences
in Surface Soil - Copper
Site 5 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

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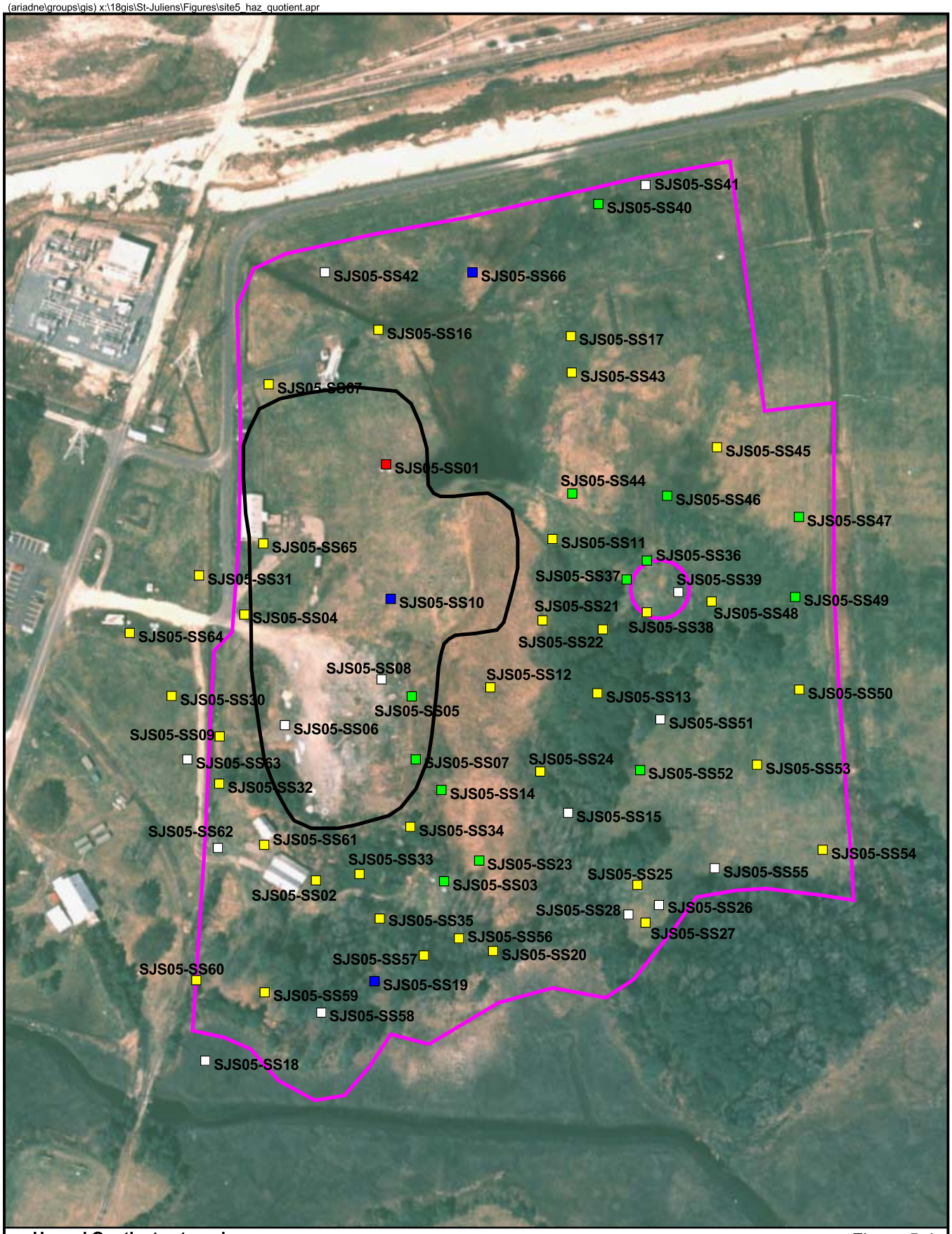

Hazard Quotient categories:

- <1
- ≥1 and <10
- ≥10 and <50
- ≥50 and <100
- ≥100

Site 5 Waste/Burnt Soil Area

Site 5 Boundary

N

0 100 200 Feet

Screening value used for Lead was 50 mg/kg

Figure 5-4
Spatial Distribution of COC Exceedences in Surface Soil - Lead
Site 5 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

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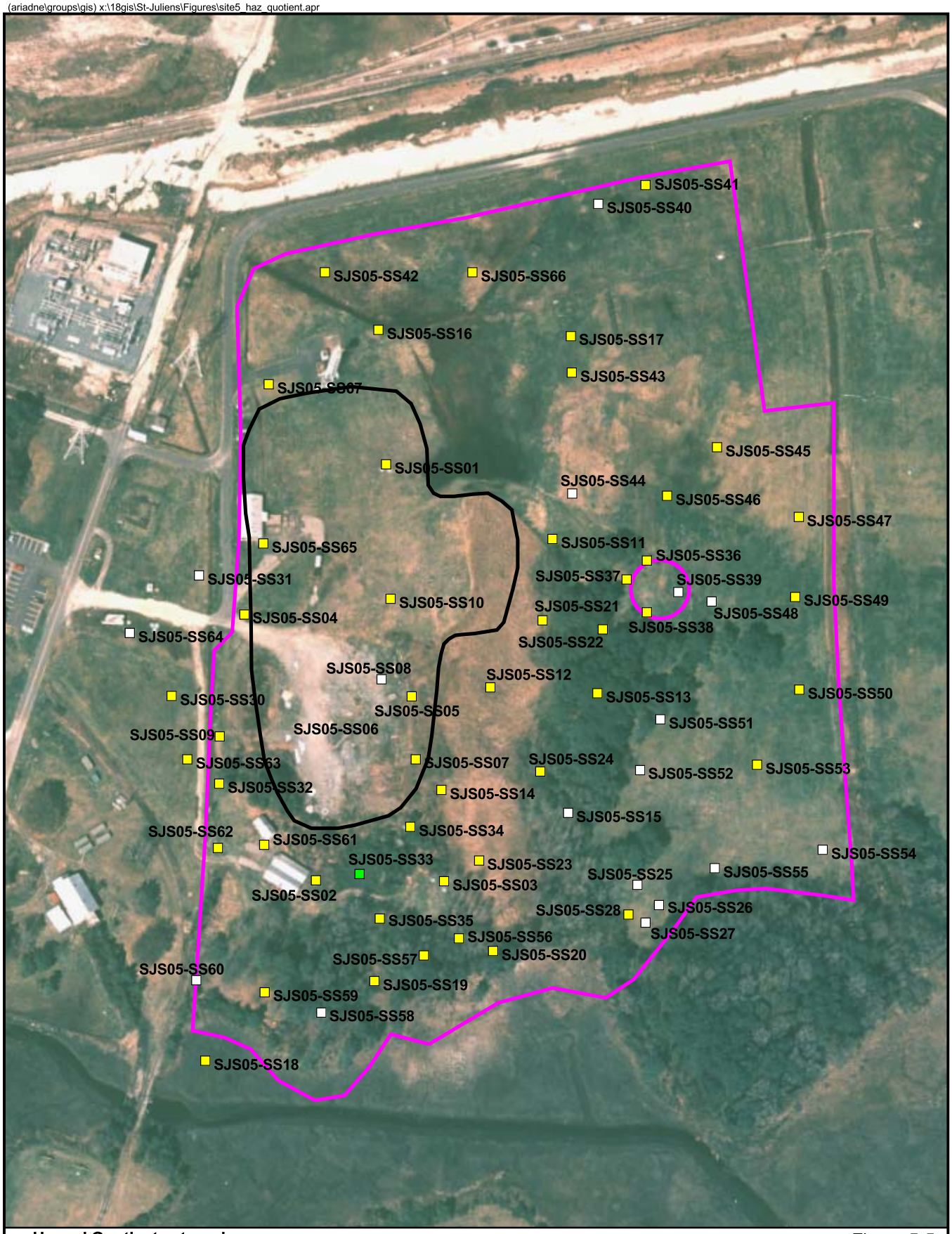

Hazard Quotient categories:

- <1
- ≥1 and <10
- ≥10 and <50
- ≥50 and <100
- ≥100

Site 5 Waste/Burnt Soil Area

Site 5 Boundary

N

0 100 200 Feet

Screening value used for Mercury was 0.1 mg/kg

Figure 5-5
Spatial Distribution of COC Exceedences
in Surface Soil - Mercury
Site 5 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

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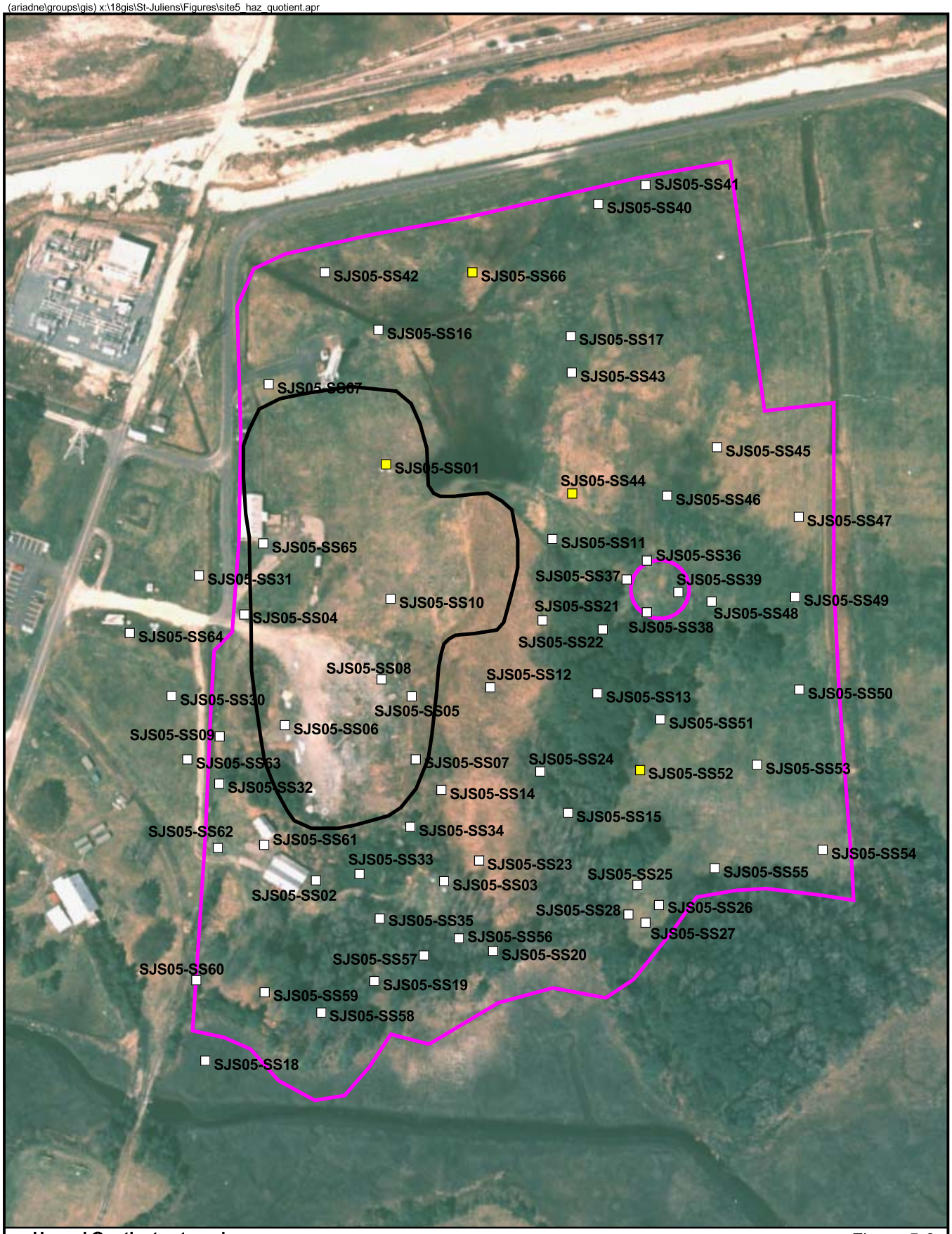

Hazard Quotient categories:

- □ <1
- ≥1 and <10
- ≥10 and <50
- ≥50 and <100
- ≥100

Site 5 Waste/Burnt Soil Area

Site 5 Boundary

N

0 100 200 Feet

Screening value used for Nickel was 2.00 mg/kg

Figure 5-6
Spatial Distribution of COC Exceedences in Surface Soil - Nickel
Site 5 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

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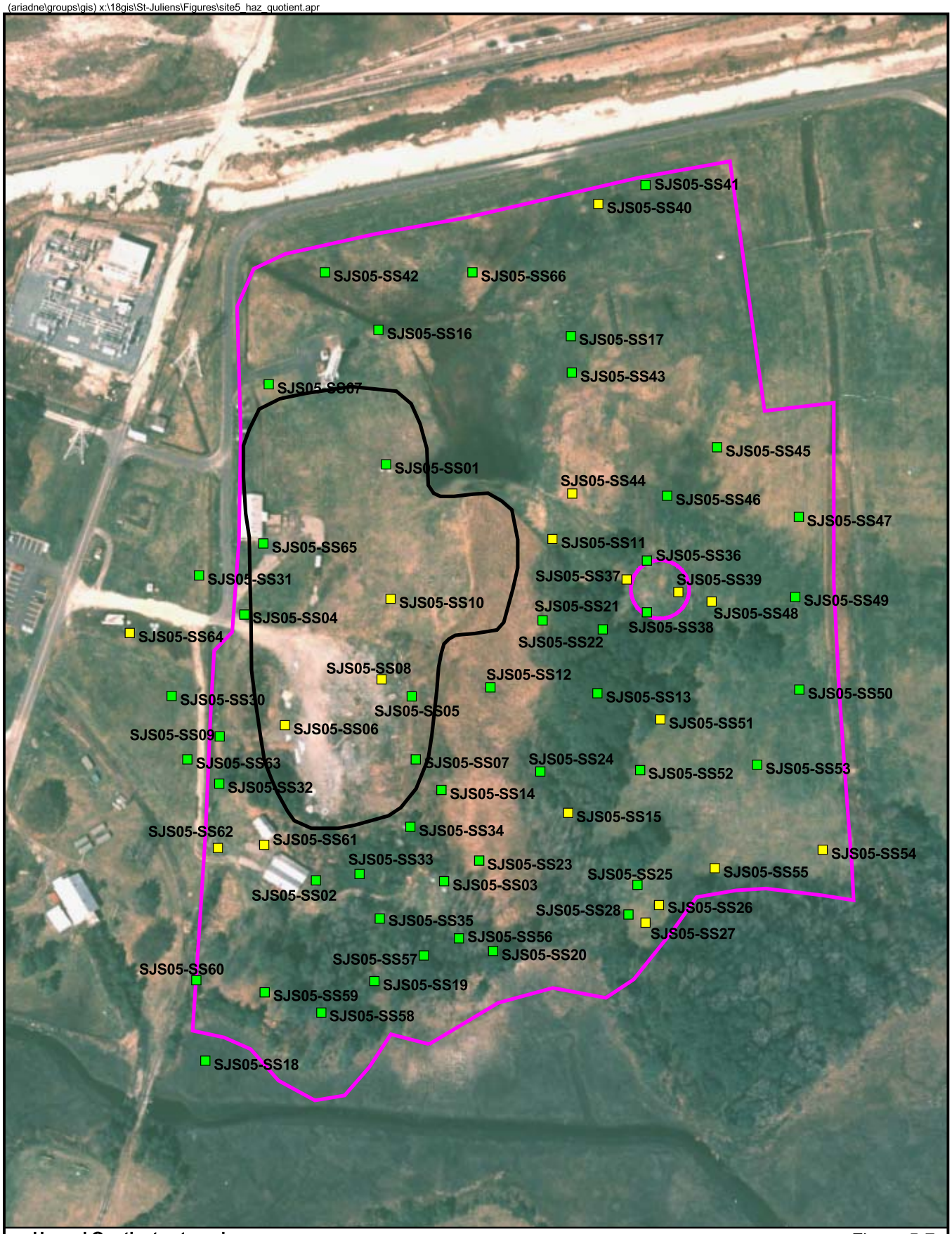

Hazard Quotient categories:

- <1
- ≥1 and <10
- ≥10 and <50
- ≥50 and <100
- ≥100

Site 5 Waste/Burnt Soil Area

Site 5 Boundary

N

0 100 200 Feet

Screening value used for Vanadium was 2 mg/kg

Figure 5-7
Spatial Distribution of COC Exceedences
in Surface Soil - Vanadium
Site 5 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

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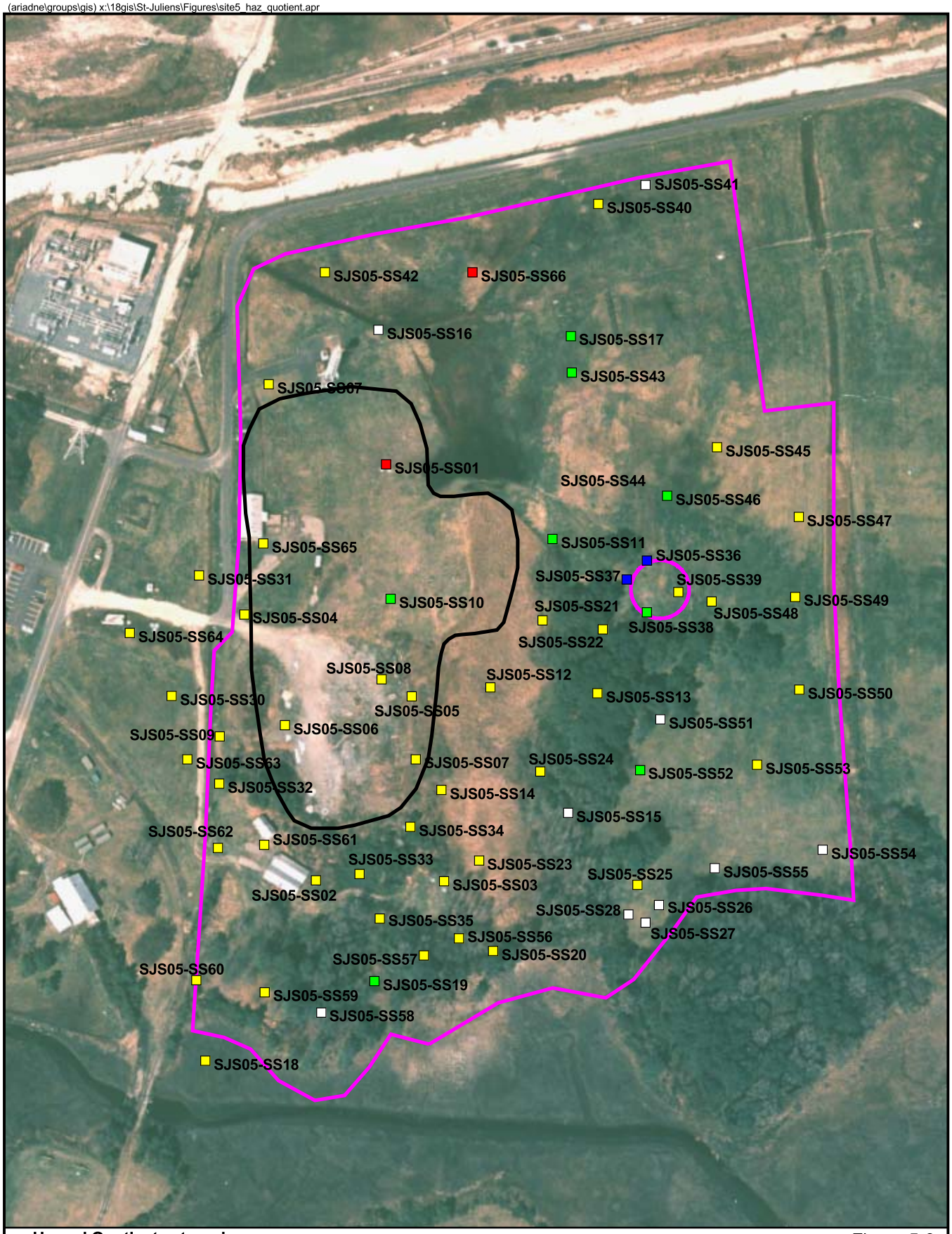

Hazard Quotient categories:

- <1
- ≥1 and <10
- ≥10 and <50
- ≥50 and <100
- ≥100

Site 5 Waste/Burnt Soil Area

Site 5 Boundary

N

0 100 200 Feet

Screening value used for Zinc was 50 mg/kg

Figure 5-8
Spatial Distribution of COC Exceedences
in Surface Soil - Zinc
Site 5 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

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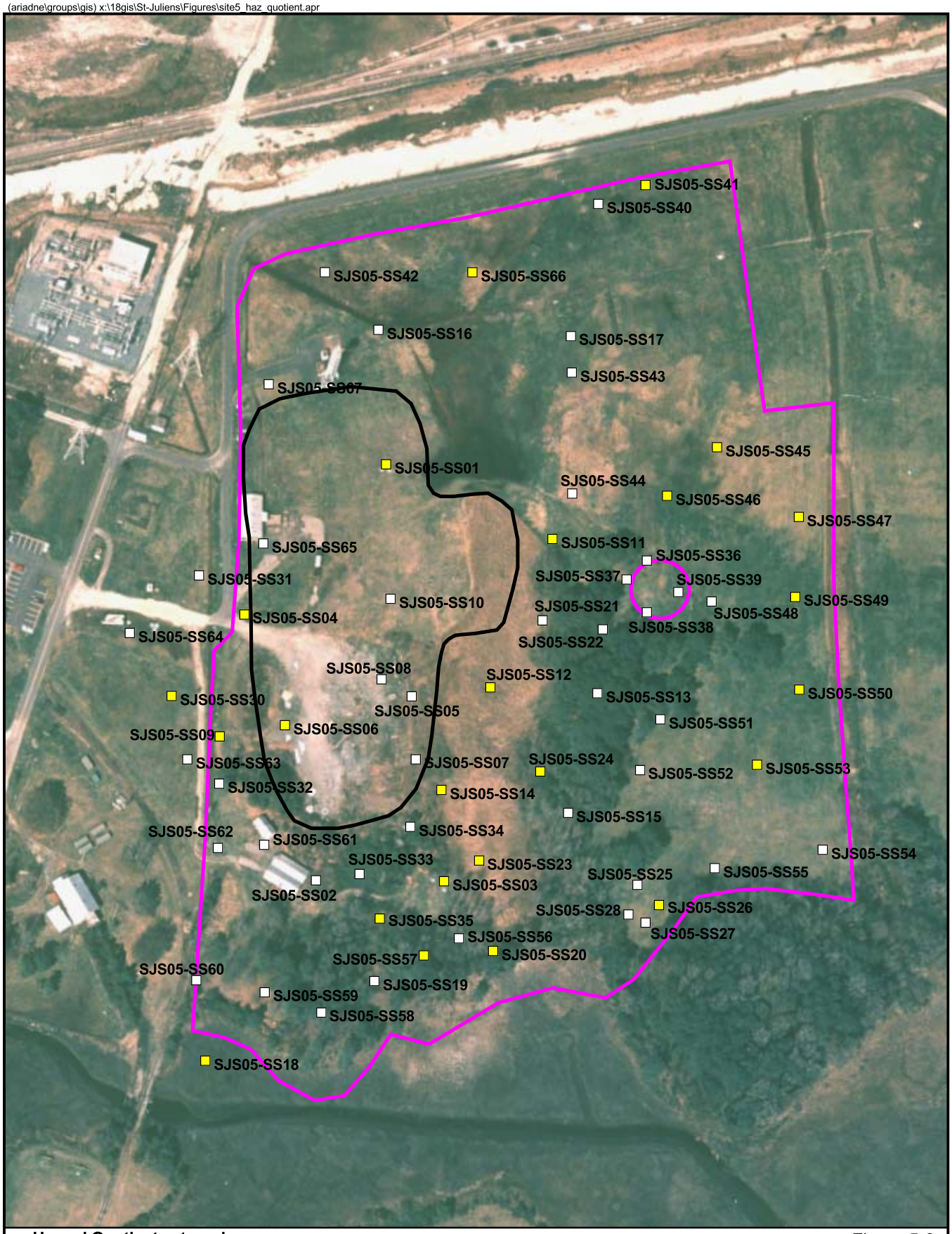

Hazard Quotient categories:

- <1
- ≥1 and <10
- ≥10 and <50
- ≥50 and <100
- ≥100

Site 5 Waste/Burnt Soil Area

Site 5 Boundary

N

0 100 200 Feet

Screening value used for PAH Total was 4,100 µg/kg

Figure 5-9
Spatial Distribution of COC Exceedences
in Surface Soil - PAH Total
Site 5 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

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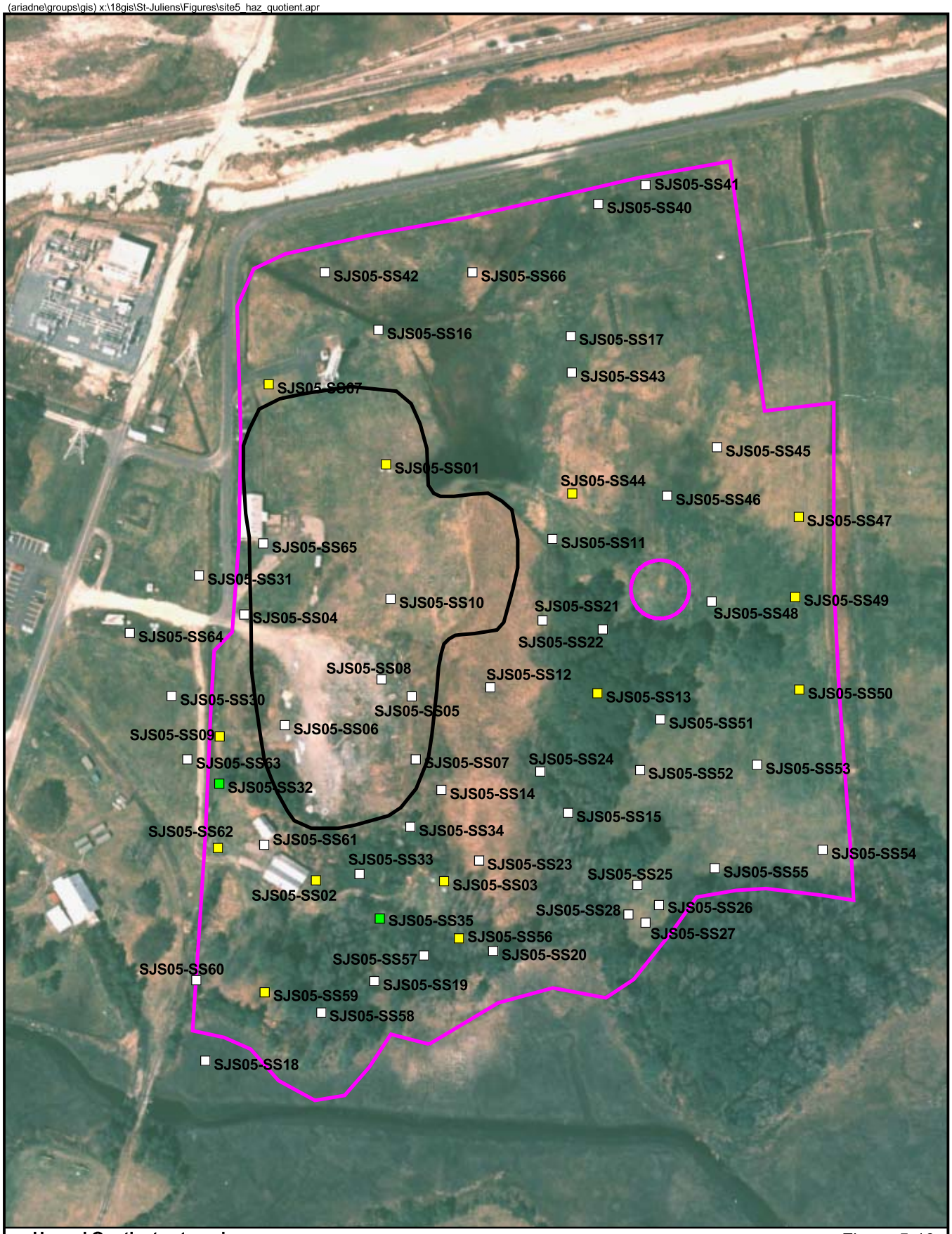

Hazard Quotient categories:

- <1
- ≥1 and <10
- ≥10 and <50
- ≥50 and <100
- ≥100

Site 5 Waste/Burnt Soil Area

Site 5 Boundary

N

0 100 200 Feet

Screening value used for DDT Total was 400 µg/kg

Figure 5-10
Spatial Distribution of COC Exceedences
in Surface Soil - DDT Total
Site 5 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

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SECTION 6

Conclusions and Recommendations

The following conclusions on the nature and extent of contamination and risk to human and ecological receptors at Site 5 have been derived from the data collected during the RI and ERI, as summarized below by media and analytical group. Risk management considerations and recommendations for next steps are also discussed.

6.1 Surface Soil

Figure 6-1 illustrates the surface soil COPCs to human and ecological receptors at concentrations above background UTLs.

VOCs. Four VOCs (1,2-dichloroethene, 2-butanone, acetone, and chloromethane) detected in surface soil during the RI were identified as COPCs to lower trophic-level receptors (plants and soil invertebrates) based on the absence of ecological screening values. Therefore, there is uncertainty associated with these compounds and overall risks to terrestrial plants/soil invertebrates. However, these VOCs were only detected sporadically at low concentrations.

There were no VOCs identified as potential risk drivers to human receptors.

SVOCs. Of the 19 SVOCs identified as COPCs to lower trophic-level receptors (plants and soil invertebrates), only acenaphthlyene and benzo(g,h,i)perylene were detected above their respective background UTLs. Acenaphthylene concentrations were above the background UTL at sample locations SJS05-SS41 and SJS05-SS57, located in the northern and southern portions of the site, respectively. Benzo(g,h,i)perylene was detected above the background UTL at SJS05-SS66, located in the northern portion of the site. Only acenaphthylene concentrations also indicated a statistical difference from background based on the population-to-population comparison. However, this was largely due to the frequency of non-detected results above background UTLs. Therefore, it is unlikely that the presence of acenaphthlyene and benzo(g,h,i)perylene in surface soil are a result of site-related activities.

There were no SVOCs identified as potential risk drivers to human receptors.

Pesticides/PCBs. 4,4'-DDE and 4,4'-DDT were identified as COPCs to lower trophic-level receptors (plants and soil invertebrates). Concentrations of 4,4'-DDE and 4,4'-DDT in surface soil exceeded background UTLs in the majority of samples and the results were also statistically different than background concentrations.

Endrin ketone and gamma chlordane were also identified as COPCs to lower trophic-level receptors (plants and soil invertebrates) based on the absence of ecological screening values. Endrin ketone was not detected in background, but was detected at low levels in isolated areas of Site 5, and gamma chlordane concentrations were below the background UTL.

Pesticides were reportedly disposed of at the Site 5 burning grounds (NEESA, August 1981). Reports also indicate that spray tanks of pesticides were generally used every day as part of

basewide application at SJCA from the 1950s through 1960s (NEESA, August 1981). The highest concentrations of pesticides at Site 5 were found in samples collected outside of the Waste/Burnt Soil Area and their presence in surface soil is likely representative of historic application at the facility and not a result of site-related activities.

There were no pesticides/PCBs identified as potential risk drivers to human receptors.

Metals. Eighteen metals (aluminum, antimony, arsenic, barium, beryllium, chromium, cobalt, copper, cyanide, iron, lead, mercury, nickel, selenium, silver, thallium, vanadium, and zinc) detected in surface soil were identified as COPCs to lower trophic-level receptors (plants and soil invertebrates). Arsenic, copper, lead, selenium, and zinc concentrations also indicate the potential for adverse effects to one or more avian and/or mammalian wildlife receptor.

The noncarcinogenic hazard to the adult and child resident was above EPA's target HI of 1.0. This hazard is mainly associated with the ingestion of copper for the adult and child resident, with a smaller contribution from arsenic and iron for the child resident. Based on the human health evaluation for lead, exposure to lead in surface soil at Site 5 may also be a potential health concern for residential children. Average lead concentrations of less than 400 mg/kg in surface soil across the site are considered adequately protective of human health under residential land-use conditions. Individual lead concentrations exceeded 400 mg/kg at 17 locations across the site. However, based on the average concentration (505 mg/kg) of lead detected in surface soil at Site 5, the two most elevated detections contribute to the elevated average. The following sample locations and respective elevated concentrations pose a potential risk to human health from exposure to surface soil at Site 5:

Sample Location	COPC	Concentration
SJS05-SS01	Copper	6,470 mg/kg
	Iron	120,000 mg/kg
	Lead	7,210 mg/kg
SJS05-SS09	Arsenic	111 K mg/kg
SJS05-SS11	Arsenic	152 mg/kg
SJS05-SS19	Lead	4,740 mg/kg
SJS05-SS38	Iron	66,800 mg/kg
SJS05-SS44	Copper	209,000 J mg/kg
SJS05-SS46	Arsenic	136 mg/kg
SJS05-SS66	Copper	99,700 J mg/kg
	Iron	66,400 mg/kg

The metals identified as COPCs to human and ecological receptors also exceeded background UTLs. Antimony, barium, and beryllium concentrations indicated a statistical difference from background based on the population-to-population comparison. However,

because the nonparametric statistical test conducted assumes that the data sets are the same shape (i.e., similar distribution), a few metals detected at the site which indicate no statistical difference from background violate assumptions based on the discrepancy in sample sizes (66 site and 10 background). Individual concentrations of arsenic, barium, copper, lead, nickel, silver, and zinc across Site 5 significantly exceeded the individual background UTLs in several samples and therefore, should be considered as different from background.

Although isolated concentrations of many metals exceed background UTLs, there is no pattern or trend of exceedance.

Dioxins and Furans. Several dioxins and furans were identified as COPCs lower trophic-level receptors (plants and soil invertebrates) based on the absence of ecological screening values.

Although the cumulative TEQ for dioxins and furans exceeded the TEF-adjusted RBC at all four sample locations (SJS05-SS44, -SS50, -SS53, and -SS66), there were no dioxins or furans identified as potential risk drivers to human receptors.

The presence of dioxins and furans in surface soil at Site 5 are likely related to the burning formerly conducted at the site. During the RI, dioxins and furans were also detected in the subsurface soil within the extent of waste.

Explosives. Two explosives (2,4-dinitrotoluene and 2-amino-4,6-dinitrotoluene) were identified as COPCs to lower trophic-level receptors (plants and soil invertebrates) based on the absence of ecological screening values.

The presence of explosives in surface soil at Site 5 are likely related to site activities. During the RI, 2,4-dinitrotoluene was also detected in one subsurface soil sample collected within the extent of waste.

There were no explosives identified as potential risk drivers to human receptors.

6.2 Groundwater

Explosives. There were no detections of explosives in deep groundwater sample SJS05-MW01D collected during the ERI. Because this monitoring well is located within the waste, the detection of RDX during the RI, most likely originated from the soil during monitoring well installation.

Metals. Shallow groundwater samples collected during the RI revealed exceedances of the MCLs for beryllium, cadmium, and lead at SJS05-MW03S and beryllium at SJS05-MW02S. During the ERI, beryllium was the only metal detected above the MCL and background UTL at SJS05-MW02S and SJS05-MW03S.

The results of the revised human health risk assessment for shallow groundwater indicate that there are no unacceptable risks for the future construction worker. Based on RME calculations potential future residential use of site groundwater may pose a noncarcinogenic hazard due to ingestion of aluminum, arsenic, cadmium, iron, thallium, and vanadium and ingestion and dermal exposure to manganese. Additionally, based on RME calculations,

arsenic is present in site groundwater at concentrations above EPA's acceptable cancer risk range.

6.3 Risk Management Considerations

Ecological risk management considerations by the SJCA Project Management Team (representatives from the Navy, EPA, and VDEQ) include:

- VOCs (1,2-dichloroethene, 2-butanone, acetone, and chloromethane) identified as COPCs to lower trophic-level receptors (plants and soil invertebrates) based on the absence of ecological screening values. These VOCs were only sporadically detected at low concentrations
- PAHs (acenaphthylene and benzo(g,h,i)perylene) identified as COPCs to lower trophic-level receptors (plants and soil invertebrates) in surface soil based on the statistical background comparison indicating that it is unlikely they are a result of site-related activities
- Pesticides (4,4'-DDE and 4,4'-DDT) identified as COPCs to lower trophic-level receptors (plants and soil invertebrates) in surface soil based on the likelihood that they reflect the historic application at the facility and do not result from site-specific activities. Additionally, endrin ketone was identified as a COPC to lower trophic-level receptors (plants and soil invertebrates) based on the absence of an ecological screening value and was only detected at low levels in isolated areas at Site 5
- No further action is warranted for deep groundwater because RDX detected in deep groundwater during the RI was not repeated during the ERI.

6.4 Recommendations

Based on the RI and ERI investigations conducted to-date, there are four areas of concern at Site 5 posing potential human health and ecological risks that warrant additional investigation and/or remedial action to achieve the remedial action objective of UU/UE.

- **Waste/Burnt Soil Area.** An EE/CA is currently under development for a NTCRA to mitigate the metals and pesticides human health and ecological risks associated with the Waste/Burnt Soil Area. The preferred alternative in the EE/CA is excavation of the waste/burnt soil and restoration/wetland creation. The removal action is scheduled for 2007.
- **Site-wide surface soil and drainage ditches.** Metals and pesticides are present in site soil outside the waste/burnt soil area at concentrations posing potential human health and/or ecological risk (Figure 6-1). A Feasibility Study is recommended to evaluate remedial alternatives.
- **Shallow groundwater**. RI and ERI data indicate the presence of inorganics in shallow groundwater. However detections have been inconsistent through various sampling rounds and potential human heath risks may therefore not be accurately quantified. The SJCA Project Management Team has agreed that two additional rounds of shallow

groundwater sampling are warranted to evaluate potential human health risks associated with metals. The groundwater sampling is scheduled to take place in June and October 2006. The results will be presented in an ERI addendum report, which will include a revised HHRA for shallow groundwater.

- **Wetland sediment.** The wetland sediment adjacent to Blows Creek has been incorporated into the BERA for Blows Creek, which is currently in regulatory review. Based on the results of the BERA, the SJCA Project Management Team will determine a path forward for Blows Creek.

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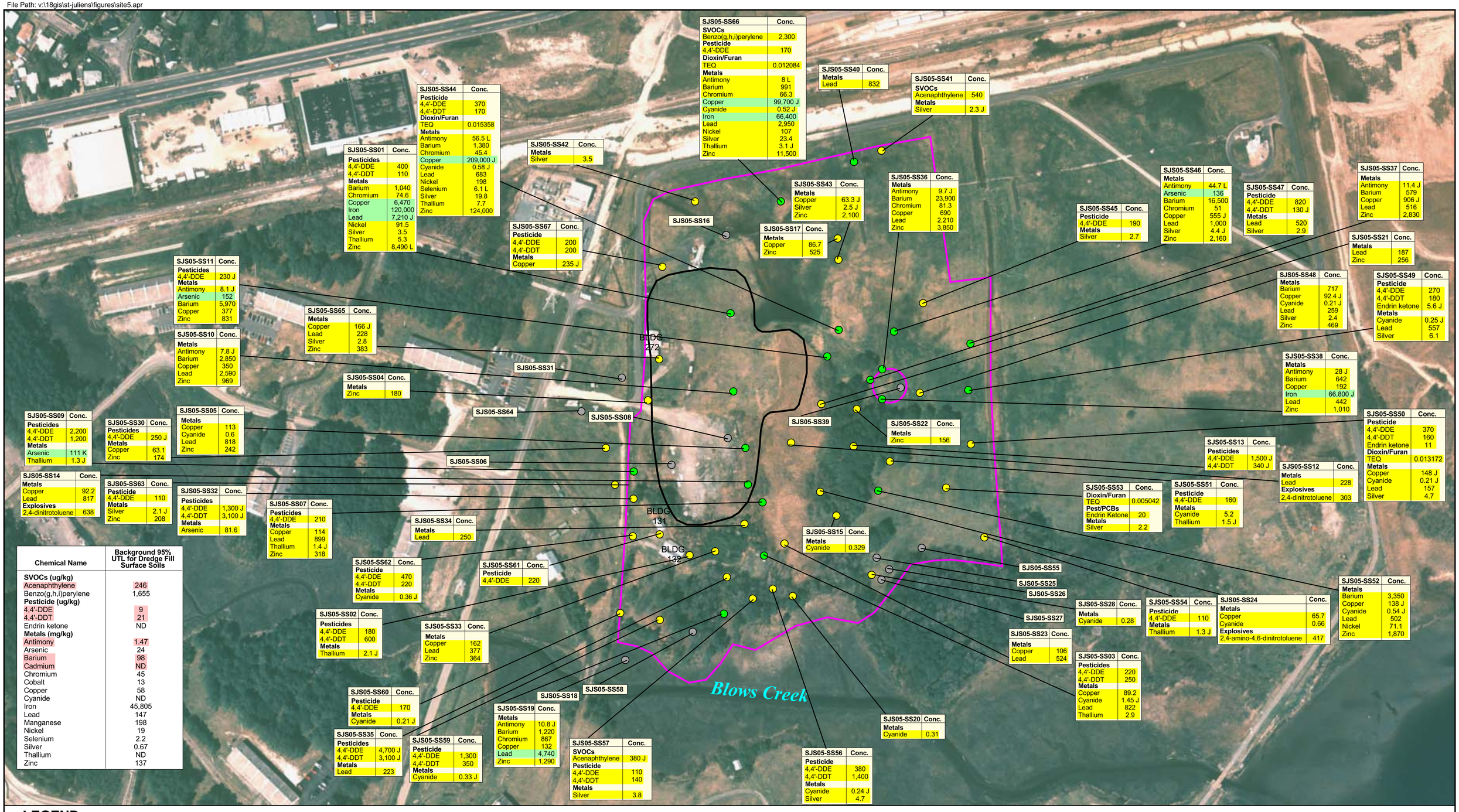

SJS05-SS01	Conc.
Pesticides	
4,4'-DDE	400
4,4'-DDT	110
Metals	
Barium	1,040
Chromium	74.6
Copper	6,470
Iron	120,000
Lead	7,210 J
Nickel	91.5
Silver	3.5
Thallium	5.3
Zinc	8,490 L

SJS05-SS02	Conc.
Pesticides	
4,4'-DDE	180
4,4'-DDT	600
Metals	
Thallium	2.1 J

SJS05-SS03	Conc.
Pesticides	
4,4'-DDE	220
4,4'-DDT	250
Metals	
Copper	89.2
Cyanide	1.45 J
Lead	822
Thallium	2.9

SJS05-SS04	Conc.
Metals	
Zinc	180

SJS05-SS05	Conc.
Metals	
Copper	113
Cyanide	0.6
Lead	818
Zinc	242

SJS05-SS06	Conc.
Pesticide	
4,4'-DDE	370
4,4'-DDT	170
Dioxin/Furan	
TEQ	0.015358
Metals	
Antimony	56.5 L
Barium	1,380
Chromium	45.4
Copper	209,000 J
Cyanide	0.58 J
Lead	683
Nickel	198
Selenium	6.1 L
Silver	19.8
Thallium	7.7
Zinc	124,000

SJS05-SS07	Conc.
Pesticides	
4,4'-DDE	210
Metals	
Copper	114
Lead	899
Thallium	1.4 J
Zinc	318

SJS05-SS08	Conc.
Metals	
Copper	99,700 J
Cyanide	0.52 J
Iron	66,400
Lead	2,950
Nickel	107
Silver	23.4
Thallium	3.1 J
Zinc	11,500

SJS05-SS09	Conc.
Pesticides	
4,4'-DDE	2,200
4,4'-DDT	1,200
Metals	
Arsenic	111 K
Thallium	1.3 J

SJS05-SS10	Conc.
Metals	
Antimony	7.8 J
Barium	2,850
Copper	350
Lead	2,590
Zinc	969

SJS05-SS11	Conc.
Pesticides	
4,4'-DDE	230 J
Metals	
Antimony	8.1 J
Arsenic	152
Barium	5,970
Copper	377
Zinc	831

SJS05-SS12	Conc.
Metals	
Lead	228
Explosives	
2,4-dinitrotoluene	303

SJS05-SS13	Conc.
Pesticides	
4,4'-DDE	1,500 J
4,4'-DDT	340 J

SJS05-SS14	Conc.
Metals	
Copper	92.2
Lead	817
Explosives	
2,4-dinitrotoluene	638

SJS05-SS15	Conc.
Metals	
Cyanide	0.329

SJS05-SS17	Conc.
Metals	
Copper	86.7
Zinc	525

SJS05-SS19	Conc.
Metals	
Antimony	10.8 J
Barium	1,220
Chromium	867
Copper	132
Lead	4,740
Zinc	1,290

SJS05-SS20	Conc.
Metals	
Cyanide	0.31

SJS05-SS21	Conc.
Metals	
Lead	187
Zinc	256

SJS05-SS22	Conc.
Metals	
Zinc	156

SJS05-SS23	Conc.
Metals	
Copper	106
Lead	524

SJS05-SS24	Conc.
Metals	
Copper	65.7
Cyanide	0.66
Explosives	
2,4-amino-4,6-dinitrotoluene	417

SJS05-SS28	Conc.
Metals	
Cyanide	0.28

SJS05-SS30	Conc.
Pesticides	
4,4'-DDE	250 J
Metals	
Copper	63.1
Zinc	174

SJS05-SS32	Conc.
Pesticides	
4,4'-DDE	1,300 J
4,4'-DDT	3,100 J
Metals	
Arsenic	81.6

SJS05-SS33	Conc.
Metals	
Copper	162
Lead	377
Zinc	364

SJS05-SS34	Conc.
Metals	
Lead	250

SJS05-SS35	Conc.
Pesticides	
4,4'-DDE	4,700 J
4,4'-DDT	3,100 J
Metals	
Lead	223

SJS05-SS36	Conc.
Metals	
Antimony	9.7 J
Barium	23,900
Chromium	81.3
Copper	690
Lead	2,210
Zinc	3,850

SJS05-SS37	Conc.
Metals	
Antimony	11.4 J
Barium	579
Copper	906 J
Lead	516
Zinc	2,830

SJS05-SS38	Conc.
Metals	
Antimony	28 J
Barium	642
Copper	192
Iron	66,800 J
Lead	442
Zinc	1,010

SJS05-SS39	Conc.
Pesticide	
4,4'-DDE	380
4,4'-DDT	1,400
Metals	
Cyanide	0.24 J
Silver	4.7

SJS05-SS40	Conc.
Metals	
Lead	832

SJS05-SS41	Conc.
SVOCs	
Acenaphthylene	540
Metals	
Silver	2.3 J

SJS05-SS42	Conc.
Metals	
Silver	3.5

SJS05-SS43	Conc.
Metals	
Copper	63.3 J
Silver	2.5 J
Zinc	2,100

SJS05-SS45	Conc.
Pesticide	
4,4'-DDE	190
Metals	
Silver	2.7

SJS05-SS46	Conc.
Metals	
Antimony	44.7 L
Arsenic	136
Barium	16,500
Chromium	51
Copper	555 J
Lead	1,000
Silver	4.4 J
Zinc	2,160

SJS05-SS47	Conc.
Pesticide	
4,4'-DDE	820
4,4'-DDT	130 J
Metals	
Lead	520
Silver	2.9

SJS05-SS48	Conc.
Metals	
Barium	717
Copper	92.4 J
Cyanide	0.21 J
Lead	259
Silver	2.4
Zinc	469

SJS05-SS49	Conc.
Pesticide	
4,4'-DDE	270
4,4'-DDT	180
Endrin ketone	5.6 J
Metals	
Cyanide	0.25 J
Lead	557
Silver	6.1

SJS05-SS50	Conc.
Pesticide	
4,4'-DDE	370
4,4'-DDT	160
Endrin ketone	11
Dioxin/Furan	
TEQ	0.013172
Metals	
Copper	148 J
Cyanide	0.21 J
Lead	157
Silver	4.7

SJS05-SS51	Conc.
Pesticide	
4,4'-DDE	160
Metals	
Cyanide	5.2
Thallium	1.5 J

SJS05-SS52	Conc.
Metals	
Barium	3,350
Copper	138 J
Cyanide	0.54 J
Lead	502
Nickel	71.1
Zinc	1,870

SJS05-SS53	Conc.
Dioxin/Furan	
TEQ	0.005042
Pest/PCBs	
Endrin Ketone	20
Metals	
Silver	2.2

SJS05-SS54	Conc.
Pesticide	
4,4'-DDE	110
Metals	
Thallium	1.3 J

SJS05-SS56	Conc.
Pesticide	
4,4'-DDE	380
4,4'-DDT	1,400
Metals	
Cyanide	0.24 J
Silver	4.7

SJS05-SS57	Conc.
SVOCs	
Acenaphthylene	380 J
Pesticide	
4,4'-DDE	110
4,4'-DDT	140
Metals	
Silver	3.8

SJS05-SS59	Conc.
Pesticide	
4,4'-DDE	1,300
4,4'-DDT	350
Metals	
Cyanide	0.33 J

SJS05-SS60	Conc.
Pesticide	
4,4'-DDE	170
Metals	
Cyanide	0.21 J

SJS05-SS61	Conc.
Pesticide	
4,4'-DDE	220

SJS05-SS62	Conc.
Pesticide	
4,4'-DDE	470
4,4'-DDT	220
Metals	
Cyanide	0.36 J

SJS05-SS63	Conc.
Pesticide	
4,4'-DDE	110
Metals	
Silver	2.1 J
Zinc	208

SJS05-SS65	Conc.
Metals	
Copper	166 J
Lead	228
Silver	2.8
Zinc	383

SJS05-SS66	Conc.
SVOCs	
Benzo(g,h,i)perylene	2,300
Pesticide	
4,4'-DDE	170
Dioxin/Furan	
TEQ	0.012084
Metals	
Antimony	8 L
Barium	991
Chromium	66.3
Copper	99,700 J
Cyanide	0.52 J
Iron	66,400
Lead	2,950
Nickel	107
Silver	23.4
Thallium	3.1 J
Zinc	11,500

SJS05-SS67	Conc.
Pesticide	
4,4'-DDE	200
4,4'-DDT	200
Metals	
Copper	235 J

Chemical Name	Background 95% UTL for Dredge Fill Surface Soils
SVOCs (ug/kg)	
Acenaphthylene	246
Benzo(g,h,i)perylene	1,655
Pesticide (ug/kg)	
4,4'-DDE	9
4,4'-DDT	21
Endrin ketone	ND
Metals (mg/kg)	
Antimony	1.47
Arsenic	24
Barium	98
Cadmium	ND
Chromium	45
Cobalt	13
Copper	58
Cyanide	ND
Iron	45,805
Lead	147
Manganese	198
Nickel	19
Selenium	2.2
Silver	0.67
Thallium	ND
Zinc	137

LEGEND

- Surface Soil Sample Locations Posing No Potential Risks
- Surface Soil Sample Locations with Ecological COPCs Exceeding Background UTLs
- Surface Soil Sample Locations with Human Health and Ecological COPCs Exceeding Background UTLs

- Site 5 Waste/Burnt Soil Area
- Site 5 Boundary

Notes:
J - Reported value may not be accurate or precise.
K - Reported value may be biased high.
L - Reported value may be biased low.
ND - Not detected
COPC - Contamintant of Potential Concern
TEQ - Toxic Equivalency
UTL - Upper Tolerance Level
Organic concentrations area in ug/kg.
Inorganic concentrations are in mg/kg.
Detected concentrations are statistically different than background concentrations.

N

0 175 350 Feet

Figure 6-1
Surface Soil COPCs Exceeding Background UTLs
Site 5 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

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SECTION 7

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Appendix A

January 8, 2004

CH2MHILL
Attn: Ms. Jamie Butler
5700 Thurston Ave, Suite 120
Virginia Beach, Virginia 23455

RE: After Action Report (AAR), for Ordnance and Explosives (OE) Avoidance Services at St. Juliens Creek Annex (SJCA), Sites 2 & 5, Chesapeake, Virginia

Dear Ms. Butler,

USA Environmental, Inc. (USA) completed the Ordnance and Explosives (OE) Avoidance/Construction Support Services at St. Juliens Creek Annex (SJCA), Sites 2 & 5, Chesapeake, Virginia. All operations were completed safely, on time, and within budgeted funding. No OE was encountered during operations

USA mobilized two UXO qualified personnel to SJCA on December 7, 2003. Both USA UXO personnel working at this site completed Naval Explosive Ordnance Disposal (USNAVSCLEOD) training which details procedures for evaluation and disposal of OE. The USA employees at this job site had completed a training program, prior to beginning work on site, which complies with OSHA Regulations 29 CFR 1910.120e(9). All USA employees who work on hazardous sites receive training, which includes an equivalent of 40 hours of training off-site and actual field experience under the direct supervision of a trained, experienced Supervisor. Management and Supervisors receive an additional 8 hours training on program supervision. Each employee receives 8 hours of OSHA refresher training annually.

On December 8, 2003 USA's UXO Technician III, Mr. George Edwards, coordinated with the CH2MHill on-site Field Team Leader/Site Safety Coordinator (FTL/SSC), assessed the site, assembled, and tested the equipment. USA personnel received the Installation briefing and security passes and operations. The entire USA/CH2MHILL team received a safety briefing from Mr. Edwards to include an initial OE safety briefing for all team members. Daily, prior to the day's operations (see Attachment 1), Mr. Edwards provided a tailgate safety briefing to re-emphasize UXO precautions and other site-specific safety issues.

Site 2-Groundwater Monitoring Wells: OE Avoidance operations for drilling four (4) monitoring wells began on Monday the 8th and completed on Tuesday the 9th. Prior to drilling or sampling crews going on site, the OE team conducted a reconnaissance of the approach route to work sites. The reconnaissance included locating a clear path for the crews, vehicles and equipment. The approach paths, at a minimum, were twice the width of the widest vehicle. The boundaries of the approach path were clearly marked to prevent personnel from straying into un-cleared areas. Personnel were instructed to remain within the marked boundary limits. A magnetometer was used to search for near surface anomalies within the approach path.

Prior to drilling equipment being moved to the proposed well location, the OE team located a subsurface anomaly free site. During drilling the OE Team checked the bore every 2-feet with a downhole magnetometer to depth.

Site 5 – Soil Borings: OE Avoidance operations for twenty-eight (28) sampling locations began on Tuesday the 9th and completed on Wednesday the 10th. Non-UXO personnel remained out of the immediate area during opening of holes for soil sampling. Once the hole was opened and cleared by the OE Team the collection personnel performed soil sampling. The OE Team remained on-site during all digging operations for sampling.

No OE or OE-related material was encountered during operations at SJCA. USA completed all operations in accordance with the approved Work Plan and contract requirements. All site operations were completed safely and efficiently and in accordance with the Technical Scope of Work.

Sincerely;

George R. Spencer
Operations Manager

Encl: Attachment 1, Daily Site Summaries and Daily Safety Briefings

USA Environmental, Inc.

SAFETY MEETING/TRAINING RECORD

DATE: 08/12/03 **TIME:** 10:30 (AM) PM

LOCATION/SITE: St. Juliens Creek, Va

1. Reason for Meeting/Training: (Check all that apply)	
✓	Daily Safety Meeting/Training
✓	Initial Site Safety Meeting/Training
	New Task Briefing
	Periodic Safety Meeting/Training
✓	New Site Procedures
	New Site Information
	Periodic Review of Site Information
	Other (Explain):

2. Personnel Attending Meeting/Training:

Name	Signature	Company
Edwards, George		USAE
Paul, Danny P.		USAE
Jamie S. Culbreth		CH2M Hill
David J Blitzer		CH2M HILL
Lewis LeFever		Parratt, Wolff Inc
William T. Friedmann Jr		CH2M HILL
Steve L Smith		Parratt Wolff Inc.

USA Environmental Inc.

Safety Meeting/Training Record Con't:

3. Topics Covered (Check all that apply)

✓	Site Safety Personnel		Decontamination Procedures
✓	Site/Work Area Description		Emergency Response Plan
✓	Site Characterization		Hazard Communition
✓	Biological Hazard(s)	✓	On-Site Emergency
	Chemical Hazard(s)		On-Site Injuries/Illnesses
✓	Physical Hazard(s)	✓	Evacuation Procedures
	Heat Stress		Rally Point(s)
✓	Cold Stress		Emergency Communication
✓	Site Control		Directions to Medical Facility
	Work and Support Zones		Drug and Alcohol Policies
✓	PPE		Medical Monitoring Program
✓	Air monitoring		Specific Task Training
✓	Safe Work Practices		Confined Spaces
	Engineering Controls and Equipment		Heavy Equipment
	Spill Containment Procedures		Other: (Specify)

4. Remarks:

5. Verification:

I certify that the personnel listed above on this record received the Information and/or Training described as indicated. Personnel not attending this meeting/training will receive said information/training prior to commencing their assigned duties.

Site Safety Officer

Date: 8 Dec 03

Page 2 of 2 Pages

File

Monday

DAILY OPERATIONS SUMMARY

DATE: 8/12/03 PAGE 1 OF 3 PAGES

SITE / LOCATION: ST. Julin's Creek, VA

1. **WORK SUMMARY**

a. Work Accomplished:	Number Completed	Total Remaining
(1) Survey		
(2) Preparation		
(3) Mag & Flag Proposed well SITE's	2	2
(4) Geophysical		
(5) Intrusive 20 FT. sample wells	2	2
(6) Quality Control		
(7) Quality Assurance		

b. Discrepancies: _____

c. Inspection Results:

	Pass	Fail
(1) Quality Control		
(2) Quality Assurance		
(3) Safety		

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE: _____

OPS-1 Form

Daily Operations Summary Con't. **PAGE 2 of 3 PAGES**

4. Utilization

a. Daily Man-hours:

Labor Category:	Task #:	M/H Used Today:	M/H Remaining:	% M/H Remaining:	Remarks:
Project Manager					
SUXO					
UXO Supervisor		10	30	75 %	
UXO Specialist		10	30	75 %	
UXO Assistant					
Laborer					
UXOSO					
UXOQCS					
Admin Personnel					
Visitor					
Sub-Contractor Personnel (List by Category)					

OPS-1 Form

Daily Operations Summary Con't. **PAGE 3 of 3 PAGES**

b. Daily Equipment:

Description:	Task:	Hours Used:	Hours Remaining:	% Hours Remaining:	Remarks:
Schonstedt		5			
Geophysical					
Truck (Heavy)					
Truck (Light)					
Radio, Base					
Radio, Handheld					
Backhoe					
Front-end Loader					
Rental Car		10			
GPS					
Weedeater					
Chainsaw					
Chipper					
Mk 26		5			

5. Operational Remarks:

Performed MAINT on Tools & equipment, Received INSTALLation Briefing and Security Passes, Survey Two well locations Perform on Site SAfety Briefing with EHJMHILL & Contractors Performed Mk 26 Checks during drilling operations.

NO Hazards OR OE were Encountered

6. Signature / Date:

[signature]
SUXO / Project Manager

Date: 8 / 12 / 03

OPS-1 Form

USA Environmental, Inc.

SAFETY MEETING/TRAINING RECORD

DATE: 9 Dec 2003 TIME: 0730 (AM) PM

LOCATION/SITE: ST. Julin's Creek, VA

1. Reason for Meeting/Training: (Check all that apply)	
✓	Daily Safety Meeting/Training
	Initial Site Safety Meeting/Training
	New Task Briefing
	Periodic Safety Meeting/Training
	New Site Procedures
	New Site Information
	Periodic Review of Site Information
	Other (Explain):

2. Personnel Attending Meeting/Training:

Name	Signature	Company
Edwards, George	[signature]	USAE
Paul, Jonny G.	[signature]	USAE
Louis LeFever	[signature]	Parratt Wolff
Steve K Smith	[signature]	Parratt Wolff
Scottie Culbreath	[signature]	CH2MHill
DAVID Blitzer	[signature]	CH2M HILL

Page 1 of 2 Pages

USA Environmental Inc.

Safety Meeting/Training Record Con't:

3. Topics Covered (Check all that apply)

	Site Safety Personnel		Decontamination Procedures
	Site/Work Area Description		Emergency Response Plan
	Site Characterization		Hazard Communition
✓	Biological Hazard(s)		On-Site Emergency
	Chemical Hazard(s)		On-Site Injuries/Illnesses
	Physical Hazard(s)		Evacuation Procedures
	Heat Stress		Rally Point(s)
✓	Cold Stress		Emergency Communication
	Site Control		Directions to Medical Facility
	Work and Support Zones		Drug and Alcohol Policies
✓	PPE		Medical Monitoring Program
✓	Air monitoring PID		Specific Task Training
✓	Safe Work Practices		Confined Spaces
	Engineering Controls and Equipment		Heavy Equipment
	Spill Containment Procedures		Other: (Specify)

4. Remarks: Drill operations, slip Trips & Falls.

5. Verification:

I certify that the personnel listed above on this record received the Information and/or Training described as indicated. Personnel not attending this meeting/training will receive said information/training prior to commencing their assigned duties.

Site Safety Officer

Date: 8/14/03

Page 2 of 2 Pages

File

Tuesday

DAILY OPERATIONS SUMMARY

DATE: 9/12/03 PAGE 1 OF 3 PAGES

SITE / LOCATION: ST. Julians Creek, VA

1. **WORK SUMMARY**

a. Work Accomplished:	Number Completed	Total Remaining
(1) Survey		
(2) Preparation		
(3) Mag & Flag (2 well Areas)	2	0
(4) Geophysical		
(5) Intrusive (20 Ft. wells)	2	0
(6) Quality Control		
(7) Quality Assurance		

b. Discrepancies: _____

c. Inspection Results:

	Pass	Fail
(1) Quality Control		
(2) Quality Assurance		
(3) Safety		

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE: _____

OPS-1 Form

Daily Operations Summary Con't. **PAGE 2 of 3 PAGES**

4. Utilization

a. Daily Man-hours:

Labor Category:	Task #:'	M/H Used Today:	M/H Remaining:	% M/H Remaining:	Remarks:
Project Manager					
SUXO					
UXO Supervisor		10	20	50%	
UXO Specialist		10	20	50%	
UXO Assistant					
Laborer					
UXOSO					
UXOQCS					
Admin Personnel					
Visitor					
Sub-Contractor Personnel (List by Category)					

OPS-1 Form

Daily Operations Summary Con't. **PAGE 3 of 3 PAGES**

b. Daily Equipment:

Description:	Task:	Hours Used:	Hours Remaining:	% Hours Remaining:	Remarks:
Schonstedt		5			
Geophysical					
Truck (Heavy)					
Truck (Light)					
Radio, Base					
Radio, Handheld					
Backhoe					
Front-end Loader					
Rental ~~Car~~ Truck		10			
GPS					
Weedeater					
Chainsaw					
Chipper					
mk 26		5			

5. Operational Remarks:
Tailgate Safety brief, Assisted in Brush removal around ~~areas~~ well ~~Areas~~, Survey Two well locations, monitored with mk 26 during drilling ops. ~~Survey areas~~ for

6. Signature / Date:

SUXO / Project Manager

Date: 9/12/03

OPS-1 Form

USA Environmental, Inc.

SAFETY MEETING/TRAINING RECORD

DATE: 10 /Dec/ 2003 TIME: 0730 (AM) PM

LOCATION/SITE: ST. Julian's Creek, VA

1. Reason for Meeting/Training: (Check all that apply)	
✓	Daily Safety Meeting/Training
	Initial Site Safety Meeting/Training
	New Task Briefing
	Periodic Safety Meeting/Training
	New Site Procedures
	New Site Information
	Periodic Review of Site Information
	Other (Explain):

2. Personnel Attending Meeting/Training:

Name	Signature	Company
Edwards, George W		USAE
Paul, Danny P.		USAE
Scott S. Culbertson		CH2M Hill
DAVID Bittner		CH2M HILL

Page 1 of 2 Pages

USA Environmental Inc.

Safety Meeting/Training Record Con't:

3. Topics Covered (Check all that apply)			
✓	Site Safety Personnel		Decontamination Procedures
✓	Site/Work Area Description		Emergency Response Plan
	Site Characterization		Hazard Communition
	Biological Hazard(s)		On-Site Emergency
	Chemical Hazard(s)		On-Site Injuries/Illnesses
✓	Physical Hazard(s)		Evacuation Procedures
	Heat Stress	✓	Rally Point(s)
✓	Cold Stress		Emergency Communication
✓	Site Control		Directions to Medical Facility
	Work and Support Zones		Drug and Alcohol Policies
✓	PPE		Medical Monitoring Program
	Air monitoring		Specific Task Training
✓	Safe Work Practices		Confined Spaces
	Engineering Controls and Equipment		Heavy Equipment
	Spill Containment Procedures		Other: (Specify)

4. Remarks: Begin digging in Area 5 To Take Soil Samples from known open burning area. Non-Essential personnel will be out of area while hole is opened for sampling once cleared collectors will move in and Take Samples as required.
Rally Point Bldg # Next To Area
Emerg # 396-3333

5. Verification:

I certify that the personnel listed above on this record received the Information and/or Training described as indicated. Personnel not attending this meeting/training will receive said information/training prior to commencing their assigned duties.

Site Safety Officer

Date: 10/02/03

Page 2 of 2 Pages

File WEN

DAILY OPERATIONS SUMMARY

DATE: 10/12/03 PAGE 1 OF 3 PAGES

SITE / LOCATION: St. Julian's Creek, VA

1. **WORK SUMMARY**

a. Work Accomplished:	Number Completed	Total Remaining
(1) Survey		
(2) Preparation		
(3) Mag & Flag		
(4) Geophysical		
(5) Intrusive (Soil Sample Locations)	28	0
(6) Quality Control		
(7) Quality Assurance		

b. Discrepancies: _____

c. Inspection Results:	Pass	Fail
(1) Quality Control		
(2) Quality Assurance		
(3) Safety		

2. INSTRUCTIONS RECEIVED FROM CUSTOMER REPRESENTATIVE:
To Assist in Soil Sampling. They wanted us on site during there digging.

OPS-1 Form

Daily Operations Summary Con't. **PAGE 2 of 3 PAGES**

4. Utilization

a. Daily Man-hours:

Labor Category:	Task #:	M/H Used Today:	M/H Remaining:	% M/H Remaining:	Remarks:
Project Manager					
SUXO					
UXO Supervisor		6	14		
UXO Specialist		6	14		
UXO Assistant					
Laborer					
UXOSO					
UXOQCS					
Admin Personnel					
Visitor					
Sub-Contractor Personnel (List by Category)					

OPS-1 Form

Daily Operations Summary Con't. **PAGE 3 of 3 PAGES**

b. Daily Equipment:

Description:	Task:	Hours Used:	Hours Remaining:	% Hours Remaining:	Remarks:
Schonstedt		6			
Geophysical					
Truck (Heavy)					
Truck (Light)					
Radio, Base					
Radio, Handheld					
Backhoe					
Front-end Loader					
Rental Car		6			
GPS					
Weedeater					
Chainsaw					
Chipper					

5. Operational Remarks:
Surveyed with Schonstedt 28 locations for soil sampling by CH2MHill.
Secured site, completed Time Cards & Travel and returned to Hotel

6. Signature / Date:

SUXO / Project Manager **Date:** 10/12/03

OPS-1 Form

Appendix B

Project: St. Julien's Creek (CTO-24)
Laboratory: Mitkem Corporation, Warwick, Rhode Island
Sample Delivery Group: B1917
Fraction: Inorganic
Matrix: Groundwater
Report Date: 2/27/2004

This analytical quality assurance report is based upon a review of analytical data generated for groundwater samples.

The sample analyses were performed in accordance with the procedures outlined in the "USEPA Contract Laboratory Program Statement of Work (SOW) for Multi-Media, Multi-Concentration Inorganic Analysis (ILM04.1).

All sample analyses have undergone an analytical quality assurance review to ensure adherence to the required protocols. Results have been validated or qualified according to general guidance provided in the Region III modifications to "Laboratory Data Validation Functional Guidelines for Validating Inorganic Analyses", USEPA 4/93. This document specifies procedures for validating data generated for CLP analyses. Therefore, the quality control requirements specified in the methods and associated acceptance criteria were also used to evaluate the non-CLP data. The following parameters were evaluated:

X	• Data Completeness
X	• Chain of Custody Documentation
X	• Holding Times
X	• Initial and Continuing Calibrations
X	• ICP Interference Check Sample Results
X	• Laboratory and Field Blank Analysis Results
X	• Matrix Spike Recoveries and Reproducibility
X	• Laboratory Duplicate Analysis Results
X	• ICP Serial Dilution Results
X	• Field Duplicate Analysis Results
X	• Laboratory Control Sample Results
	• GFAA Post-Digestion Spike Recovery/Duplicate Burn Precision
X	• Qualitative Identification
X	• Quantitation/Reporting Limits

X - Denotes parameter evaluated.

It is recommended that the data only be used according to the qualifiers presented, and discussed in this report. All other data should be considered qualitatively and quantitatively valid as reported by the laboratory, based on the items evaluated.

Report Approved By:

Shawn M. Rodgers
President

2/27/2004
Date

1.0 *DATA COMPLETENESS*

The data package was complete.

2.0 *CHAIN OF CUSTODY DOCUMENTATION*

All chain of custody documentation was complete.

3.0 *HOLDING TIMES*

All criteria were met. No qualifiers were applied.

4.0 *INITIAL AND CONTINUING CALIBRATIONS*

All criteria were met. No qualifiers were applied.

5.0 *ICP INTERFERENCE CHECK SAMPLE RESULTS*

All criteria were met. No qualifiers were applied.

6.0 *LABORATORY AND FIELD BLANK ANALYSIS RESULTS*

6.1 *TOTAL METALS*

Positive results reported for the following inorganic analytes in the samples are qualitatively invalid due to their presence in the associated laboratory method blanks. USEPA Region III protocol requires positive results for inorganic contaminants that are less than or equal to five times the blank contamination level, to be considered qualitatively invalid. Placing "B" qualifiers next to the quantitative results for these metals in the samples has indicated this.

Analyte	Affected Samples
Iron	SJS02-MW03S-03D, SJS02-MW06S-03D, SJS02-MW07S-03D, SJS02-MW09S-03D
Nickel	SJS02-MW08S-03D
Zinc	SJS02-MW07S-03D,

6.2 *DISSOLVED METALS*

Positive results reported for the following inorganic analytes in the samples are qualitatively invalid due to their presence in the associated laboratory method blanks. USEPA Region III protocol requires positive results for inorganic contaminants that are less than or equal to five times the blank contamination level, to be considered qualitatively invalid. Placing "B" qualifiers next to the quantitative results for these metals in the samples has indicated this.

Analyte	Affected Samples
Copper	SJS02-MW03S-03D, SJS02-MW06S-03D, SJS02-MW09S-03D
Lead	SJS02-MW06S-03D, SJS02-MW09S-03D
Zinc	SJS02-MW07S-03D

7.0 *MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERIES AND REPRODUCIBILITY*

7.1 *TOTAL METAL*

Positive results and detection limits for selenium and cyanide for the samples are biased low quantitative estimates and may be higher than reported. Positive and nondetected selenium results are also biased low. The associated matrix spike recoveries were below the acceptance limit for these analytes. The low recoveries indicate the presence of interferences for samples of similar matrix. Positive selenium and cyanide and

selenium results have been marked "L" to indicate that they are biased low. Detection limits for selenium are marked "UL".

8.0 LABORATORY DUPLICATE RESULTS

All criteria were met. No qualifiers were applied.

9.0 ICP SERIAL DILUTION RESULTS

9.1 DISSOLVED METALS

The positive iron, magnesium, and manganese results for the samples should be considered quantitative estimates. The ICP serial dilution criterion was exceeded for this element. The lack of precision may be due to interferences in samples of similar matrix. The positive iron, magnesium, and manganese results for the samples have been marked with "J" qualifiers to indicate that they are quantitative estimates.

10.0 FIELD DUPLICATE RESULTS

Duplicate sample pairs SJS05-MW02S-00-03D and SJS05-MW02S-00-03D-P, and SJS05-MW08S-00-03D and SJS05-MW08S-00-03D were submitted to the laboratory evaluate sampling and analytical precision for those analytes determined to be present. Results for these duplicate samples are presented in Tables 2 and 3. There are no USEPA-established acceptance criteria for field duplicate samples. EDQ uses internal acceptance criterion of 40 percent for values greater than five times the CRDL (or $\pm$ two times the CRDL for results less than five times the CRDL). Results for detected analytes for the duplicate samples met RPD criteria.

11.0 LABORATORY CONTROL SAMPLE RESULTS

All criteria were met. No qualifiers were applied.

12.0 GFAA POST-DIGESTION SPIKE/DUPLICATE BURN

This parameter is not applicable to the analyses performed.

13.0 QUALITATIVE IDENTIFICATION

All criteria were met. No qualifiers were applied.

14.0 QUANTITATION/REPORTING LIMITS

The laboratory reported results for metals detected in samples at concentrations greater than the instrument detection limit, but less than the CRDL with "B" flags. EDQ has flagged results for metals below the CRDL with "J" qualifiers to indicate that they are quantitative estimates.

Project: St. Julien's Creek (CTO-24)
Laboratory: Mitkem Corporation, Warwick, Rhode Island
Sample Delivery Group: B1907
Fraction: Inorganic
Matrix: Soil
Report Date: 2/27/2004

This analytical quality assurance report is based upon a review of analytical data generated for soil samples.

The sample analyses were performed in accordance with the procedures outlined in the "USEPA Contract Laboratory Program Statement of Work (SOW) for Multi-Media, Multi-Concentration Inorganic Analysis (ILM04.1).

All sample analyses have undergone an analytical quality assurance review to ensure adherence to the required protocols. Results have been validated or qualified according to general guidance provided in the Region III modifications to "Laboratory Data Validation Functional Guidelines for Validating Inorganic Analyses", USEPA 4/93. This document specifies procedures for validating data generated for CLP analyses. Therefore, the quality control requirements specified in the methods and associated acceptance criteria were also used to evaluate the non-CLP data. The following parameters were evaluated:

X	• Data Completeness
X	• Chain of Custody Documentation
X	• Holding Times
X	• Initial and Continuing Calibrations
X	• ICP Interference Check Sample Results
X	• Laboratory and Field Blank Analysis Results
X	• Matrix Spike Recoveries and Reproducibility
X	• Laboratory Duplicate Analysis Results
	• ICP Serial Dilution Results
	• Field Duplicate Analysis Results
X	• Laboratory Control Sample Results
	• GFAA Post-Digestion Spike Recovery/Duplicate Burn Precision
X	• Qualitative Identification
X	• Quantitation/Reporting Limits

X - Denotes parameter evaluated.

It is recommended that the data only be used according to the qualifiers presented, and discussed in this report. All other data should be considered qualitatively and quantitatively valid as reported by the laboratory, based on the items evaluated.

Report Approved By:

Shawne M. Rodgers
President

2/27/2004
Date

1.0 *DATA COMPLETENESS*

The data package was complete.

2.0 *CHAIN OF CUSTODY DOCUMENTATION*

All chain of custody documentation was complete.

3.0 *HOLDING TIMES*

All criteria were met. No qualifiers were applied.

4.0 *INITIAL AND CONTINUING CALIBRATIONS*

All criteria were met. No qualifiers were applied.

5.0 *ICP INTERFERENCE CHECK SAMPLE RESULTS*

All criteria were met. No qualifiers were applied.

6.0 *LABORATORY AND FIELD BLANK ANALYSIS RESULTS*

Positive results reported for the following inorganic analytes in the samples are qualitatively invalid due to their presence in the associated laboratory method blanks. USEPA Region III protocol requires positive results for inorganic contaminants that are less than or equal to five times the blank contamination level, to be considered qualitatively invalid. Placing "B" qualifiers next to the quantitative results for these metals in the samples has indicated this.

Analyte	Affected Samples
Potassium	SJS05-SS40-00-03D, SJS05-SS55-00-03D, SJS05-SS58-00-03D, SJS05-SS59-00-03D, SJS05-SS60-00-03D
Sodium	SJS05-SS40-00-03D, SJS05-SS55-00-03D

7.0 MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERIES AND REPRODUCIBILITY

Positive results and detection limits for antimony for the samples are biased low quantitative estimates and may be higher than reported. The associated matrix spike recovery was below the acceptance limit for this analyte. The low recoveries indicate the presence of interferences for samples of similar matrix. Positive antimony results have been marked "L" to indicate that they are biased low. Detection limits are marked "UL".

Positive results for manganese for all samples should be considered biased high quantitative estimates and may be lower than reported. The associated matrix spike recovery was above the acceptance limit for this analyte. The high recovery indicates the presence of interferences for manganese for samples of similar matrix. The positive results have been marked "K" to indicate that they are biased high quantitative estimates.

8.0 LABORATORY DUPLICATE RESULTS

All criteria were met. No qualifiers were applied.

9.0 ICP SERIAL DILUTION RESULTS

The positive cobalt, copper, and zinc results for the samples should be considered quantitative estimates. The ICP serial dilution criterion was exceeded for this element. The lack of precision may be due to interferences in samples of similar matrix. The positive cobalt, copper,

and zinc results for the samples have been marked with "J" qualifiers to indicate that they are quantitative estimates.

10.0 FIELD DUPLICATE RESULTS

Duplicate sample pairs SJS05-SS42-00-03D and SJS05-SS42-00-03D-P were submitted to the laboratory evaluate sampling and analytical precision for those analytes determined to be present. Results for these duplicate samples are presented in Table 2. There are no USEPA-established acceptance criteria for field duplicate samples. EDQ uses internal acceptance criterion of 40 percent for values greater than five times the CRDL (or ± two times the CRDL for results less than five times the CRDL). Results for detected analytes for the duplicate samples met RPD criteria.

11.0 LABORATORY CONTROL SAMPLE RESULTS

All criteria were met. No qualifiers were applied.

12.0 GFAA POST-DIGESTION SPIKE/DUPLICATE BURN

This parameter is not applicable to the analyses performed.

13.0 QUALITATIVE IDENTIFICATION

All criteria were met. No qualifiers were applied.

14.0 QUANTITATION/REPORTING LIMITS

The laboratory reported results for metals detected in samples at concentrations greater than the instrument detection limit, but less than the CRDL with "B" flags. EDQ has flagged results for metals below the CRDL with "J" qualifiers to indicate that they are quantitative estimates.

Table 2 Field Duplicate Sample Results for Inorganics
Duplicate Samples SJS05-SS42-00-03D and SJS05-SS42-00-03D-P

Analyte	SJS05-SS42-00-03D (mg/Kg)		SJS05-SS42-00-03D-P (mg/Kg)		RPD	FOOT NOTES
Aluminum	7510		8410		11.3	
Arsenic	9.5		9.4		1.1	
Barium	39.3	J	46.6	J	17.0	
Beryllium	0.39	J	0.45	J	14.3	
Cadmium	0.057	U	0.05	U	13.1	
Calcium	1010	J	1100	J	8.5	
Chromium	11.8		13.8		15.6	
Cobalt	6.7	J	10.2	J	41.4	Already Qualified
Copper	13.6	J	14.8	J	8.5	
Iron	25800		20300		23.9	
Lead	27.6		36.9		28.8	
Magnesium	1910		2120		10.4	
Manganese	379	K	558	K	38.2	
Mercury	0.11	J	0.14	J	24.0	
Nickel	8.7	J	14.0		46.7	Already Qualified
Potassium	2160		1930		11.2	
Silver	3.5		2.7		46.7	Less than 5 X CRDL
Sodium	1710		1450		16.5	
Vanadium	18.6		26.4		34.7	
Zinc	78.2	J	93.7	J	18.0	

Project: St. Julien's Creek (CTO-24)
Laboratory: Mitkem Corporation, Warwick, Rhode Island
Sample Delivery Group: B1906
Fraction: Inorganic
Matrix: Soil
Report Date: 2/27/2004

This analytical quality assurance report is based upon a review of analytical data generated for soil samples.

The sample analyses were performed in accordance with the procedures outlined in the "USEPA Contract Laboratory Program Statement of Work (SOW) for Multi-Media, Multi-Concentration Inorganic Analysis (ILM04.1).

All sample analyses have undergone an analytical quality assurance review to ensure adherence to the required protocols. Results have been validated or qualified according to general guidance provided in the Region III modifications to "Laboratory Data Validation Functional Guidelines for Validating Inorganic Analyses", USEPA 4/93. This document specifies procedures for validating data generated for CLP analyses. Therefore, the quality control requirements specified in the methods and associated acceptance criteria were also used to evaluate the non-CLP data. The following parameters were evaluated:

X	• Data Completeness
X	• Chain of Custody Documentation
X	• Holding Times
X	• Initial and Continuing Calibrations
X	• ICP Interference Check Sample Results
X	• Laboratory and Field Blank Analysis Results
X	• Matrix Spike Recoveries and Reproducibility
X	• Laboratory Duplicate Analysis Results
	• ICP Serial Dilution Results
	• Field Duplicate Analysis Results
X	• Laboratory Control Sample Results
	• GFAA Post-Digestion Spike Recovery/Duplicate Burn Precision
X	• Qualitative Identification
X	• Quantitation/Reporting Limits

X - Denotes parameter evaluated.

It is recommended that the data only be used according to the qualifiers presented, and discussed in this report. All other data should be considered qualitatively and quantitatively valid as reported by the laboratory, based on the items evaluated.

Report Approved By:

Shawne M. Rodgers
President

2/27/2009
Date

1.0 *DATA COMPLETENESS*

The data package was complete.

2.0 *CHAIN OF CUSTODY DOCUMENTATION*

All chain of custody documentation was complete.

3.0 *HOLDING TIMES*

All criteria were met. No qualifiers were applied.

4.0 *INITIAL AND CONTINUING CALIBRATIONS*

All criteria were met. No qualifiers were applied.

5.0 *ICP INTERFERENCE CHECK SAMPLE RESULTS*

All criteria were met. No qualifiers were applied.

6.0 *LABORATORY AND FIELD BLANK ANALYSIS RESULTS*

Positive results reported for the following inorganic analytes in the samples are qualitatively invalid due to their presence in the associated laboratory method blanks. USEPA Region III protocol requires positive results for inorganic contaminants that are less than or equal to five times the blank contamination level, to be considered qualitatively invalid. Placing "B" qualifiers next to the quantitative results for these metals in the samples has indicated this.

Analyte	Affected Samples
Potassium	SJS05-SS44-00-03D
Sodium	SJS05-SS44-00-03D, SJS05-SS45-00-03D, SJS05-SS46-00-03D, SJS05-SS47-00-03D, SJS05-SS48-00-03D, SJS05-SS48-00-03DP, SJS05-SS50-00-03D, SJS05-SS50-00-03DP, SJS05-SS52-00-03D, SJS05-SS53-00-03D, SJS05-SS62-00-03D, SJS05-SS63-00-03D, SJS05-SS64-00-03D, SJS05-SS65-00-03D

7.0 MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERIES AND REPRODUCIBILITY

The nondetected results for antimony for the samples have been rejected and should be considered suspect. The associated matrix spike/matrix spike recoveries were less than 30 percent for this analyte. The poor recoveries indicate the presence of severe interferences for samples of similar matrix. The nondetected results have bee marked "R" to indicate that they are suspect.

Positive results for antimony, for the samples are biased low quantitative estimates and may be higher than reported. Positive and nondetected selenium results are also biased low. The associated matrix spike recoveries were below the acceptance limit for these analytes. The low recoveries indicate the presence of interferences for samples of similar matrix. Positive antimony and selenium results have been marked "L" to indicate that they are biased low. Detection limits for selenium are marked "UL".

8.0 LABORATORY DUPLICATE RESULTS

The positive calcium results reported for the samples are quantitative estimates. The laboratory duplicate precision criterion was exceeded for this analyte. This lack of precision may be due to sample heterogeneity. The positive calcium results have been marked with "J" qualifiers on the data summary tables to indicate that they are quantitative estimates.

9.0 *ICP SERIAL DILUTION RESULTS*

The positive copper results for the samples should be considered quantitative estimates. The ICP serial dilution criterion was exceeded for this element. The lack of precision may be due to interferences in samples of similar matrix. The positive copper results for the samples have been marked with "J" qualifiers to indicate that they are quantitative estimates.

10.0 *FIELD DUPLICATE RESULTS*

Duplicate sample pairs SJS05-SS48-00-03D and SJS05-SS48-00-03D-P, and SJS05-SS50-00-03D and SJS05-SS50-00-03D were submitted to the laboratory evaluate sampling and analytical precision for those analytes determined to be present. Results for these duplicate samples are presented in Tables 2 and 3. There are no USEPA-established acceptance criteria for field duplicate samples. EDQ uses internal acceptance criterion of 40 percent for values greater than five times the CRDL (or $\pm$ two times the CRDL for results less than five times the CRDL). Results for detected analytes for the duplicate samples met RPD criteria.

11.0 *LABORATORY CONTROL SAMPLE RESULTS*

All criteria were met. No qualifiers were applied.

12.0 *GFAA POST-DIGESTION SPIKE/DUPLICATE BURN*

This parameter is not applicable to the analyses performed.

13.0 *QUALITATIVE IDENTIFICATION*

All criteria were met. No qualifiers were applied.

14.0 *QUANTITATION/REPORTING LIMITS*

The laboratory reported results for metals detected in samples at concentrations greater than the instrument detection limit, but less than the CRDL with "B" flags. EDQ has flagged results for metals below the CRDL with "J" qualifiers to indicate that they are quantitative estimates.

Table 3 Field Duplicate Sample Results for Inorganics
Duplicate Samples SJS05-SS50-00-03D and SJS05-SS50-00-03D-P

Analyte	SJS05-SS50-00-03D (mg/Kg)		SJS05-SS50-00-03D-P (mg/Kg)		RPD	FOOT NOTES
Aluminum	16700		19400		15.0	
Arsenic	10.3		11		6.6	
Barium	118		121		2.5	
Beryllium	0.48	J	0.43	J	11.0	
Calcium	2280	J	2350	J	3.0	
Chromium	30.7		35.3		13.9	
Cobalt	4	J	4.7	J	16.1	
Copper	148	J	76.8	J	63.3	
Cyanide	0.21	J	ND		NC	
Iron	29000		31300		7.6	
Lead	135		157		15.1	
Magnesium	3000		3600		18.2	
Manganese	107		121		12.3	
Mercury	0.37		0.52		33.7	
Nickel	10.9		13.7		22.8	
Potassium	2280		2620		13.9	
Silver	4.3		4.7		8.9	
Vanadium	48.6		53.9		10.3	
Zinc	104		114		9.2	

Table 2 Field Duplicate Sample Results for Inorganics
Duplicate Samples SJS05-SS48-00-03D and SJS05-SS48-00-03D-P

Analyte	SJS05-SS48-00-03D (mg/Kg)		SJS05-SS48-00-03D-P (mg/Kg)		RPD	FOOT NOTES
Aluminum	8630		9870		13.4	
Antimony	0.54	L	1.7	L	103.6	
Arsenic	8.3		10.4		22.5	
Barium	466		717		42.4	*
Beryllium	0.36	J	0.36	J	0.0	
Cadmium	3.1		4.1		27.8	
Calcium	9170	J	8530	J	7.2	
Chromium	27.3		26.4		3.4	
Cobalt	4	J	3.8	J	5.1	
Copper	88	J	92.4	J	4.9	
Cyanide	0.21	J	ND		NC	
Iron	13700		15000		9.1	
Lead	214		259		19.0	
Magnesium	1810		1790		1.1	
Manganese	236		255		7.7	
Mercury	0.09	J	0.074	J	19.5	
Nickel	8.4	J	8.7	J	3.5	
Potassium	1150		1160	J	0.9	
Silver	2.2	J	2.4		8.7	
Thallium	0.52	J	ND		NC	
Vanadium	19		19.7		3.6	
Zinc	345		469		30.5	

Project: St. Julien's Creek (CTO-24)
Laboratory: Severn Trent Laboratories, Knoxville, Tennessee
Sample Delivery Group: B1906
Fraction: Organic
Matrix: Soil
Report Date: 2/27/2004

This analytical quality assurance report is based upon a review of analytical data generated for soil samples. The sample locations, laboratory identification numbers, sample collection dates, sample matrix, and analyses performed are presented in Table 1.

The samples were analyzed for polychlorinated dibenzodioxin and polychlorinated dibenzofuran compounds (PCDD/PCDFs). The sample analyses were performed in accordance with the procedures outlined in method 8290, "Test Methods for Evaluating Solid Wastes", SW-846, third edition, Promulgated Updates II, IIA, and III, June 1997.

All sample analyses have undergone an analytical quality assurance review to ensure adherence to the required protocols. Results have been validated or qualified according to general guidance provided in the Region III modifications to "Laboratory Data Validation Functional Guidelines for Validating Organic Analyses", USEPA 9/94, and "Standard Operating Procedure for Dioxin/Furan Data Validation", DRAFT, March 1999. These documents specify procedures for validating data generated for CLP analyses. Therefore, the quality control requirements specified in the methods and associated acceptance criteria were also used to evaluate the non-CLP data. The parameters presented on the following page were evaluated.

X	•	Data Completeness
X	•	Chain of Custody Documentation
X	•	Holding Times
X	•	Instrument Performance
X	•	Initial and Continuing Calibrations
X	•	Laboratory and Field Blank Analysis Results
X	•	Surrogate Compound Recoveries
X	•	Matrix Spike/Matrix Spike Duplicate Recoveries and Reproducibility
	•	Field Duplicate Analysis Results
X	•	Laboratory Control Sample Results
X	•	Internal Standard Performance
X	•	Qualitative Identification
X	•	Quantitation/Reporting Limits

X - Denotes parameter evaluated.

It is recommended that the data only be used according to the qualifiers presented, and discussed in this report. All other data should be considered qualitatively and quantitatively valid as reported by the laboratory, based on the items evaluated.

Report Approved By:

Shawne M. Rodgers
President

2/27/2009
Date

1.0 *DATA COMPLETENESS*

The data deliverables were complete.

2.0 *CHAIN OF CUSTODY DOCUMENTATION*

All chain of custody documentation was complete.

3.0 *HOLDING TIMES*

All criteria were met. No qualifiers were applied.

4.0 *INITIAL AND CONTINUING CALIBRATIONS*

All criteria were met. No qualifiers were applied.

5.0 *LABORATORY AND FIELD BLANK ANALYSIS RESULTS*

The following positive results are qualitatively invalid due to the presence of these compounds in associated field and laboratory method blanks. USEPA Region III protocol requires positive results for common contaminants, such as OCDD or OCDF, that are less than or equal to ten times the associated blank contamination level, to be considered qualitatively invalid. Results for uncommon contaminants, such as the other PCDD/PCDFs, present at concentrations less than five times the level of an associated blank are also invalid. Placing "B" qualifiers next to these quantitative results for these samples has indicated this.

Isomer	Qualified Results
2,3,7,8-TCDD	SJS05-SS44-00-03D, SJS05-SS50-00-03D, SJS05-SS50-00-03D-P SJS05-SS66-00-03D
1, 2, 3, 7, 8, 9-HxCDF	SJS05-SS50-00-03D, SJS05-SS50-00-03D-P, SJS05-SS53-00-03D, SJS05-SS66-00-03D
1, 2, 3, 4, 7, 8, 9-HpCDF	SJS05-SS50-00-03D, SJS05-SS53-00-03D, SJS05-SS66-00-03D

6.0 SURROGATE COMPOUNDS

All criteria were met. No qualifiers were applied.

7.0 MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERIES AND REPRODUCIBILITY

All criteria were met. No qualifiers were applied.

8.0 FIELD DUPLICATE RESULTS

There were no field duplicate samples included in this SDG.

9.0 LABORATORY CONTROL SAMPLE RESULTS

All criteria were met. No qualifiers were applied.

10.0 INTERNAL STANDARD PERFORMANCE

The result for 2, 3, 7, 8-TCDD for sample SJS05-SS53-00-03D should be considered a biased low quantitative estimate, and may be higher than

reported. The recovery for the associated internal standard was below the acceptance criterion. The result has been marked with a "J" qualifier to indicate that it is a quantitative estimate.

11.0 QUALITATIVE IDENTIFICATION

The following results should be considered estimated maximum possible concentrations. The ion abundance ratios for these compounds were outside the method-specified criteria, but were within Region III expanded criterion of ± 25 percent. These substituted isomer are considered to be presents, and are qualified "J".

Sample Number	Parameter
SJS05-SS53-00-03D	2,3,7,8-TCDF, 1,2,3,4,7,8-HxCDD, 2,3,4,6,7,8-HxCDF

12.0 QUANTITATION/REPORTING LIMITS

The positive results reported for 2, 3, 7, 8-TCDF for samples SJS05-SS44-00-03D, SJS05-SS50-00-03D, SJS05-SS50-00-03D-P, and SJS05-SS66-00-03D should be considered quantitative estimates. Poor precision was observed for this isomer on the dual chromatographic columns used for sample analysis. As required by USEPA protocol, the laboratory for reporting purposes used the lower concentration for these compounds. The results for 2, 3, 7, 8-TCDF have been marked with "J" qualifiers to indicate that they are quantitative estimates.

As required by USEPA protocol, all compounds, which were qualitatively identified at concentrations below their respective Quantitation Limits (QLs), have been marked with "J" qualifiers to indicate that they are quantitative estimates.

Project: St. Julien's Creek (CTO-24)
Laboratory: Mitkem Corporation, Warwick, Rhode Island
Sample Delivery Group: C0015
Fraction: Organic
Matrix: Sediment
Report Date: 2/27/2004

This analytical quality assurance report is based upon a review of analytical data generated for sediment samples. The sample locations, laboratory identification numbers, sample collection dates, sample matrix, and analyses performed are presented in Table 1.

The samples were analyzed for semivolatile organic compounds, and pesticide/PCB constituents. The sample analyses were performed in accordance with the procedures outlined in the OLM03 USEPA Contract Laboratory Program (CLP) Statement of Work for Organic) Analysis.

All sample analyses have undergone an analytical quality assurance review to ensure adherence to the required protocols. Results have been validated or qualified according to general guidance provided in the Region III modifications to "Laboratory Data Validation Functional Guidelines for Validating Organic Analyses", USEPA 9/94. This document specifies procedures for validating data generated for CLP analyses. Therefore, the quality control requirements specified in the methods and associated acceptance criteria were also used to evaluate the non-CLP data. The parameters presented on the following page were evaluated.

X	•	Data Completeness
X	•	Chain of Custody Documentation
X	•	Holding Times
X	•	Instrument Performance
X	•	Initial and Continuing Calibrations
X	•	Laboratory and Field Blank Analysis Results
X	•	Surrogate Compound Recoveries
X	•	Matrix Spike/Matrix Spike Duplicate Recoveries and Reproducibility
	•	Field Duplicate Analysis Results
X	•	Laboratory Control Sample Results
X	•	Internal Standard Performance
X	•	Qualitative Identification
X	•	Quantitation/Reporting Limits

X - Denotes parameter evaluated.

It is recommended that the data only be used according to the qualifiers presented, and discussed in this report. All other data should be considered qualitatively and quantitatively valid as reported by the laboratory, based on the items evaluated.

Report Approved By:

Shawnie M. Rodgers
President

2/27/2004
Date

1.0 *DATA COMPLETENESS*

The data deliverables were complete. Analyses for polychlorinated dibenzodioxins/polychlorinated dibenzofurans were completed by Severn Trent Laboratories, Knoxville, Tennessee. Data validation for these analyses is discussed in a separate report.

2.0 *CHAIN OF CUSTODY DOCUMENTATION*

The chain of custody documentation was complete.

3.0 *HOLDING TIMES*

All criteria were met. No qualifiers were applied.

4.0 *INSTRUMENT PERFORMANCE*

All criteria were met. No qualifiers were applied.

5.0 *INITIAL AND CONTINUING CALIBRATIONS*

All criteria were met. No qualifiers were applied.

6.0 *LABORATORY AND FIELD BLANK ANALYSIS RESULTS*

- The positive results reported for the compounds presented below are qualitatively invalid due to the presence of these compounds in associated field and laboratory method blanks. USEPA Region III protocol requires positive results for common contaminants, such as methylene chloride, that are less than or equal to ten times the associated blank contamination level, to be considered qualitatively invalid. Placing "B" qualifiers next to these quantitative results for these samples has indicated this.

Compound	Samples With Qualified Results
Benzaldehyde	SJS02-SD16-00-04A-P
Bis-(2-Ethylhexyl)phthalate	SJS02-SD16-00-04A-P, SJS02-SD17-00-04A, SJS02-SD19-00-04A, SJS02-SD20-00-04A, SJSREF-SD01-00-04A, SJSREF-SD02-00-04A, SJSREF-SD03-00-04A, SJSREF-SD03-00-04A-P, SJSREF-SD04-00-04A, SJSREF-SD05-00-04A

7.0 SURROGATE COMPOUNDS

All criteria were met. No qualifiers were applied.

8.0 MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERIES AND REPRODUCIBILITY

All criteria were met. No qualifiers were applied.

9.0 FIELD DUPLICATE RESULTS

Duplicate sample SJS05-SS48-00-03D and SJS05-SS48-00-03D-P, and SJS05-SS50-00-03D and SJS05-SS50-00-03D were submitted to the laboratory to evaluate sampling and analytical precision for those organic compounds determined to be present. Results for these duplicate samples are presented in Tables 2 and 3. Precision is evaluated by calculating the relative percent difference (%RPD) between duplicate pair results. There are no USEPA-established acceptance criteria for field duplicate samples. EDQ uses internal acceptance criteria of thirty percent for volatile detected compounds (and 40 percent for extractable compounds) to evaluate soil field duplicate samples.

10.0 LABORATORY CONTROL SAMPLE RESULTS

All criteria were met. No qualifiers were applied.

11.0 INTERNAL STANDARD PERFORMANCE

All criteria were met. No qualifiers were applied.

12.0 QUALITATIVE IDENTIFICATION

All criteria were met. No qualifiers were applied.

13.0 QUANTITATION/REPORTING LIMITS

The positive results reported for the pesticide/PCB constituents for the following samples should be considered quantitative estimates. Poor precision was observed for these compounds on the dual chromatographic columns used for sample analysis. As required by USEPA protocol, the laboratory for reporting purposes used the lower concentration for these compounds. The results for the pesticide/ PCB constituents have been marked with "J" qualifiers to indicate that they are quantitative estimates.

Sample	Dilution Factor	Compounds Reported From Dilution
SJS02-SD02-00-04D	5.0	4,4'-DDE

As required by EPA protocol, all compounds that were qualitatively identified at concentrations below their respective Contract Required Quantitation Limits (CRQLs) have been reported with "J" qualifiers on the data summary tables to indicate that they are quantitative estimates.

Project: St. Julien's Creek (CTO-24)
Laboratory: Mitkem Corporation, Warwick, Rhode Island
Sample Delivery Group: C0015
Fraction: Inorganic
Matrix: Sediment
Report Date: 2/27/2004

This analytical quality assurance report is based upon a review of analytical data generated for sediment samples.

The sample analyses were performed in accordance with the procedures outlined in the "USEPA Contract Laboratory Program Statement of Work (SOW) for Multi-Media, Multi-Concentration Inorganic Analysis (ILM04.1), and total organic carbon by EPA method 415.1 (modified).

All sample analyses have undergone an analytical quality assurance review to ensure adherence to the required protocols. Results have been validated or qualified according to general guidance provided in the Region III modifications to "Laboratory Data Validation Functional Guidelines for Validating Inorganic Analyses", USEPA 4/93. This document specifies procedures for validating data generated for CLP analyses. Therefore, the quality control requirements specified in the methods and associated acceptance criteria were also used to evaluate the non-CLP data. The following parameters were evaluated:

X	• Data Completeness
X	• Chain of Custody Documentation
X	• Holding Times
X	• Initial and Continuing Calibrations
X	• ICP Interference Check Sample Results
X	• Laboratory and Field Blank Analysis Results
X	• Matrix Spike Recoveries and Reproducibility
X	• Laboratory Duplicate Analysis Results
	• ICP Serial Dilution Results
	• Field Duplicate Analysis Results
X	• Laboratory Control Sample Results
	• GFAA Post-Digestion Spike Recovery/Duplicate Burn Precision
X	• Qualitative Identification
X	• Quantitation/Reporting Limits

X - Denotes parameter evaluated.

It is recommended that the data only be used according to the qualifiers presented, and discussed in this report. All other data should be considered qualitatively and quantitatively valid as reported by the laboratory, based on the items evaluated.

Report Approved By:

Shawne M. Rodgers
President

2/27/2004
Date

1.0 *DATA COMPLETENESS*

The data package was complete.

2.0 *CHAIN OF CUSTODY DOCUMENTATION*

All chain of custody documentation was complete.

3.0 *HOLDING TIMES*

All criteria were met. No qualifiers were applied.

4.0 *INITIAL AND CONTINUING CALIBRATIONS*

All criteria were met. No qualifiers were applied.

5.0 *ICP INTERFERENCE CHECK SAMPLE RESULTS*

All criteria were met. No qualifiers were applied.

6.0 *LABORATORY AND FIELD BLANK ANALYSIS RESULTS*

All criteria were met. No qualifiers were applied.

7.0 *MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERIES AND REPRODUCIBILITY*

Positive results and detection limits for antimony for the samples are biased low quantitative estimates and may be higher than reported. The associated matrix spike recovery was below the acceptance limit for this analyte. The low recoveries indicate the presence of interferences for samples of similar matrix. Positive antimony results have been marked

"L" to indicate that they are biased low. Detection limits are marked "UL".

Positive results for copper and zinc for all samples should be considered biased high quantitative estimates and may be lower than reported. The associated matrix spike recovery was above the acceptance limit for this analyte. The high recovery indicates the presence of interferences for copper and zinc for samples of similar matrix. The positive results have been marked "K" to indicate that they are biased high quantitative estimates.

8.0 LABORATORY DUPLICATE RESULTS

The positive calcium results reported for the samples are quantitative estimates. The laboratory duplicate precision criterion was exceeded for this analyte. This lack of precision may be due to sample heterogeneity. The positive calcium results have been marked with "J" qualifiers on the data summary tables to indicate that they are quantitative estimates.

9.0 ICP SERIAL DILUTION RESULTS

All criteria were met. No qualifiers were applied.

10.0 FIELD DUPLICATE RESULTS

Duplicate sample pairs SJS02-SD16-00-04D and SJS02-SD16-00-04D-P, and SJSREF-SD03-00-04D and SJSREF-SD03-00-04D were submitted to the laboratory evaluate sampling and analytical precision for those analytes determined to be present. Results for these duplicate samples are presented in Tables 2 and 3. There are no USEPA-established acceptance criteria for field duplicate samples. EDQ uses internal acceptance criterion of 40 percent for values greater than five times the CRDL (or $\pm$ two times the CRDL for results less than five times the CRDL). Results for detected analytes for the duplicate samples met RPD criteria.

11.0 LABORATORY CONTROL SAMPLE RESULTS

All criteria were met. No qualifiers were applied.

12.0 GFAA POST-DIGESTION SPIKE/DUPLICATE BURN

This parameter is not applicable to the analyses performed.

13.0 QUALITATIVE IDENTIFICATION

All criteria were met. No qualifiers were applied.

14.0 QUANTITATION/REPORTING LIMITS

The laboratory reported results for metals detected in samples at concentrations greater than the instrument detection limit, but less than the CRDL with "B" flags. EDQ has flagged results for metals below the CRDL with "J" qualifiers to indicate that they are quantitative estimates.

Table 2 Field Duplicate Sample Results for Inorganics
Duplicate Samples SJS02-SD16-00-04D and SJS02-SD16-00-04D-P

Analyte	SJS02-SD16-00-04D (mg/Kg)		SJS02-SD16-00-04D-P (mg/Kg)		RPD	FOOT NOTES
Aluminum	19600		16200		19.0	
Arsenic	13.7		14.2		3.6	
Barium	43.8	J	38.2	J	13.7	
Beryllium	0.83	J	0.73	J	12.8	
Calcium	222		2010		160.2	*
Chromium	36.7		32.8		11.2	
Cobalt	7.9	J	6.7	J	16.4	
Copper	35	K	47.8	K	30.9	
Iron	33500		29200		13.7	
Lead	58.1		77		28.0	
Magnesium	6640		5490		19.0	
Manganese	223		181		20.8	
Mercury	0.46		0.39		16.5	
Nickel	16.7		14	J	17.6	
Potassium	3580		2850		22.7	
Silver	1.6	J	1.5	J	6.5	
Sodium	7610		7000		8.4	
Vanadium	37.3		30.9		18.8	
Zinc	144	K	173	K	18.3	

Table 3 Field Duplicate Sample Results for Inorganics
Duplicate Samples SJSREF-SD03-00-04D and SJSREF-SD03-00-04D-P

Analyte	SJSREF-SD03-00-04D (mg/Kg)		SJSREF-SD03-00-04D-P (mg/Kg)		RPD	FOOT NOTES
Aluminum	17300		19200		10.4	
Arsenic	12.8		13.1		2.3	
Barium	39.3	J	42	J	6.6	
Beryllium	0.77	J	0.78	J	1.3	
Cadmium	0.11	J	ND		NC	
Calcium	2040		2120		3.8	
Chromium	32.5		32.6		0.3	
Cobalt	6.8	J	6.6	J	NC	
Copper	55.2	K	47.4	K	15.2	
Cyanide	ND		2.0		NC	
Iron	27700		28300		2.1	
Lead	77.6		80.6		3.8	
Magnesium	5340		5590		4.6	
Manganese	165		161		2.5	
Mercury	0.55		0.6		8.7	
Nickel	15.1		15.1	J	0.0	
Potassium	2840		2950		3.8	
Silver	1.5	J	1.5	J	0.0	
Sodium	7380		7770		5.1	
Vanadium	31.6		33.1		4.6	
Zinc	218	K	184	K	16.9	

Project: St. Julien's Creek (CTO-24)
Laboratory: Mitkem Corporation, Warwick, Rhode Island
Sample Delivery Group: B1917
Fraction: Organic
Matrix: Groundwater
Report Date: 2/27/2004

This analytical quality assurance report is based upon a review of analytical data generated for groundwater samples. The sample locations, laboratory identification numbers, sample collection dates, sample matrix, and analyses performed are presented in Table 1.

The samples were analyzed for volatile organic compounds, semivolatile organic compounds, pesticide/PCB constituents, and explosive compound RDX. The sample analyses were performed in accordance with the procedures outlined in the OLM03 and OLC02 USEPA Contract Laboratory Program (CLP) Statements of Work for Organic Analysis.

All sample analyses have undergone an analytical quality assurance review to ensure adherence to the required protocols. Results have been validated or qualified according to general guidance provided in the Region III modifications to "Laboratory Data Validation Functional Guidelines for Validating Organic Analyses", USEPA 9/94. This document specifies procedures for validating data generated for CLP analyses. Therefore, the quality control requirements specified in the methods and associated acceptance criteria were also used to evaluate the non-CLP data. The parameters presented on the following page were evaluated.

X	•	Data Completeness
X	•	Chain of Custody Documentation
X	•	Holding Times
X	•	Instrument Performance
X	•	Initial and Continuing Calibrations
X	•	Laboratory and Field Blank Analysis Results
X	•	Surrogate Compound Recoveries
X	•	Matrix Spike/Matrix Spike Duplicate Recoveries and Reproducibility
X	•	Field Duplicate Analysis Results
X	•	Laboratory Control Sample Results
X	•	Internal Standard Performance
X	•	Qualitative Identification
X	•	Quantitation/Reporting Limits

X - Denotes parameter evaluated.

It is recommended that the data only be used according to the qualifiers presented, and discussed in this report. All other data should be considered qualitatively and quantitatively valid as reported by the laboratory, based on the items evaluated.

Report Approved By:

Shawne M. Rodgers
President

2/27/2004
Date

1.0 DATA COMPLETENESS

The data deliverables were complete.

2.0 CHAIN OF CUSTODY DOCUMENTATION

The chain of custody documentation was complete.

3.0 HOLDING TIMES

All criteria were met. No qualifiers were applied.

4.0 INSTRUMENT PERFORMANCE

All criteria were met. No qualifiers were applied.

5.0 INITIAL AND CONTINUING CALIBRATIONS

All criteria were met. No qualifiers were applied.

6.0 LABORATORY AND FIELD BLANK ANALYSIS RESULTS

The following positive results are qualitatively invalid due to the presence of these compounds in associated field and laboratory method blanks. USEPA Region III protocol requires positive results for common contaminants, such as acetone and methylene chloride, that are less than or equal to ten times the associated blank contamination level, to be considered qualitatively invalid. Results for uncommon contaminants, such as chloromethane, present in samples at concentrations less than five times the blank level are also invalid. Placing "B" qualifiers next to these quantitative results for these samples has indicated this.

Compound	Samples With Qualified Results
Acetone	SJS02-MW08S-00-03D-P
Chloromethane	SJS02-MW06S-00-03D, SJS02-MW08S-00-03D, SJS02-MW08S-00-03D-P, SJS02-MW09S-00-03D
Methylene Chloride	SJS02-MW06S-00-03D, SJS02-MW08S-00-03D, SJS02-MW08S-00-03D-P, SJS02-MW09S-00-03D

7.0 *SURROGATE COMPOUNDS*

Nondetected results for volatile compounds trifluoromethane, 1,1,2-trichloro-1,2,2-trifluoroethane, acetone, methyl acetate, methyl-tert-butyl ether, 1,1-dichloroethane, 2-butanone, bromochloromethane, chloroform, 1,1,1-trichloroethane, carbon tetrachloride, and 1,2-dichloroethane for sample SJS02-MW07S-03D have been rejected, and should be considered suspect. The associated deuterated monitoring compound recoveries were less than 20 percent. The low recoveries indicate the possibility of severe analytical inefficiencies for this sample. The results for the affected compounds have been marked "R" to indicate that they are suspect.

8.0 *MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERIES AND REPRODUCIBILITY*

All criteria were met. No qualifiers were applied.

9.0 *FIELD DUPLICATE RESULTS*

Duplicate sample SJS05-MW02S-00-03D and SJS05-MW02S-00-03D-P, and SJS05-MW08S-00-03D and SJS05-MW08S-00-03D were submitted to the laboratory to evaluate sampling and analytical precision for those organic compounds determined to be present. Results for these duplicate samples are presented in Tables 2 and 3. Precision is evaluated by calculating the relative percent difference (%RPD) between duplicate pair results. There are no USEPA-established acceptance criteria for field duplicate samples. EDQ uses internal acceptance criteria of twenty percent for volatile

detected compounds (and 25 percent for extractable compounds) to evaluate groundwater field duplicate samples.

10.0 LABORATORY CONTROL SAMPLE RESULTS

All criteria were met. No qualifiers were applied.

11.0 INTERNAL STANDARD PERFORMANCE

All criteria were met. No qualifiers were applied.

12.0 QUALITATIVE IDENTIFICATION

All criteria were met. No qualifiers were applied.

13.0 *QUANTITATION/REPORTING LIMITS*

The positive results reported for the pesticide/PCB constituents for the following samples should be considered quantitative estimates. Poor precision was observed for these compounds on the dual chromatographic columns used for sample analysis. As required by USEPA protocol, the laboratory for reporting purposes used the lower concentration for these compounds. The results for the pesticide/ PCB constituents have been marked with "J" qualifiers to indicate that they are quantitative estimates.

Sample	Qualified Results
SJS02-MW08S-00-03D-P	Heptachlor Epoxide

Sample SJS02-MW07S-03D was re-analyzed at a 5000-fold dilution for volatile organic compounds. The dilution analysis was performed because the responses for cis-1, 2-dichloroethene and trichloroethene exceeded the linear range of the GC/MS instrument. The results for the affected compounds have been reported from the diluted analysis. All other results for volatile organic compounds have been reported from the initial analyses.

Sample SJS02-MW07S-03D was re-analyzed at an 8.0-fold dilution for semivolatile organic compounds. The dilution analysis was performed because the response for naphthalene exceeded the linear range of the GC/MS instrument. The results for the affected compound have been reported from the diluted analysis. All other results for semivolatile organic compounds have been reported from the initial analyses.

The following samples were re-analyzed at dilutions for pesticide/PCB constituents. The dilution analyses were performed because pesticide/PCB constituents exceeded the linear range of the GC instrument. The results for the affected compounds have been reported from the diluted analysis. All other results for pesticide/PCB constituents have been reported from the initial analyses.

Sample	Dilution Factor	Compounds Reported From Dilution
SJS02-MW08S-00-03D	5.0	Heptachlor Epoxide
SJS02-MW08S-00-03D-P	5.0	Heptachlor Epoxide

Results for 1, 1-dichloroethene, and trans-1, 2-dichloroethene for sample SJS02-MW07S-03D should be considered quantitative estimates. The responses for these compounds exceeded the GC/MS instrument linear range for the volatile analysis for this sample. The subsequent dilution resulted in responses for these compounds that were below detectable levels. The results have been marked with "J" qualifiers to indicate that they are estimates.

As required by EPA protocol, all compounds that were qualitatively identified at concentrations below their respective Contract Required Quantitation Limits (CRQLs) have been reported with "J" qualifiers on the data summary tables to indicate that they are quantitative estimates.

Project: St. Julien's Creek (CTO-24)
Laboratory: Severn Trent Laboratories, Knoxville, Tennessee
Sample Delivery Group: B1906
Fraction: Organic
Matrix: Soil
Report Date: 2/27/2004

This analytical quality assurance report is based upon a review of analytical data generated for soil samples. The sample locations, laboratory identification numbers, sample collection dates, sample matrix, and analyses performed are presented in Table 1.

The samples were analyzed for polychlorinated dibenzodioxin and polychlorinated dibenzofuran compounds (PCDD/PCDFs). The sample analyses were performed in accordance with the procedures outlined in method 8290, "Test Methods for Evaluating Solid Wastes", SW-846, third edition, Promulgated Updates II, IIA, and III, June 1997.

All sample analyses have undergone an analytical quality assurance review to ensure adherence to the required protocols. Results have been validated or qualified according to general guidance provided in the Region III modifications to "Laboratory Data Validation Functional Guidelines for Validating Organic Analyses", USEPA 9/94, and "Standard Operating Procedure for Dioxin/Furan Data Validation", DRAFT, March 1999. These documents specify procedures for validating data generated for CLP analyses. Therefore, the quality control requirements specified in the methods and associated acceptance criteria were also used to evaluate the non-CLP data. The parameters presented on the following page were evaluated.

X	•	Data Completeness
X	•	Chain of Custody Documentation
X	•	Holding Times
X	•	Instrument Performance
X	•	Initial and Continuing Calibrations
X	•	Laboratory and Field Blank Analysis Results
X	•	Surrogate Compound Recoveries
X	•	Matrix Spike/Matrix Spike Duplicate Recoveries and Reproducibility
	•	Field Duplicate Analysis Results
X	•	Laboratory Control Sample Results
X	•	Internal Standard Performance
X	•	Qualitative Identification
X	•	Quantitation/Reporting Limits

X - Denotes parameter evaluated.

It is recommended that the data only be used according to the qualifiers presented, and discussed in this report. All other data should be considered qualitatively and quantitatively valid as reported by the laboratory, based on the items evaluated.

Report Approved By:

Shawne M. Rodgers
President

2/27/2009
Date

1.0 *DATA COMPLETENESS*

The data deliverables were complete.

2.0 *CHAIN OF CUSTODY DOCUMENTATION*

All chain of custody documentation was complete.

3.0 *HOLDING TIMES*

All criteria were met. No qualifiers were applied.

4.0 *INITIAL AND CONTINUING CALIBRATIONS*

All criteria were met. No qualifiers were applied.

5.0 *LABORATORY AND FIELD BLANK ANALYSIS RESULTS*

The following positive results are qualitatively invalid due to the presence of these compounds in associated field and laboratory method blanks. USEPA Region III protocol requires positive results for common contaminants, such as OCDD or OCDF, that are less than or equal to ten times the associated blank contamination level, to be considered qualitatively invalid. Results for uncommon contaminants, such as the other PCDD/PCDFs, present at concentrations less than five times the level of an associated blank are also invalid. Placing "B" qualifiers next to these quantitative results for these samples has indicated this.

Isomer	Qualified Results
2,3,7,8-TCDD	SJS05-SS44-00-03D, SJS05-SS50-00-03D, SJS05-SS50-00-03D-P SJS05-SS66-00-03D
1, 2, 3, 7, 8, 9-HxCDF	SJS05-SS50-00-03D, SJS05-SS50-00-03D-P, SJS05-SS53-00-03D, SJS05-SS66-00-03D
1, 2, 3, 4, 7, 8, 9-HpCDF	SJS05-SS50-00-03D, SJS05-SS53-00-03D, SJS05-SS66-00-03D

6.0 SURROGATE COMPOUNDS

All criteria were met. No qualifiers were applied.

7.0 MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERIES AND REPRODUCIBILITY

All criteria were met. No qualifiers were applied.

8.0 FIELD DUPLICATE RESULTS

There were no field duplicate samples included in this SDG.

9.0 LABORATORY CONTROL SAMPLE RESULTS

All criteria were met. No qualifiers were applied.

10.0 INTERNAL STANDARD PERFORMANCE

The result for 2, 3, 7, 8-TCDD for sample SJS05-SS53-00-03D should be considered a biased low quantitative estimate, and may be higher than

reported. The recovery for the associated internal standard was below the acceptance criterion. The result has been marked with a "J" qualifier to indicate that it is a quantitative estimate.

11.0 QUALITATIVE IDENTIFICATION

The following results should be considered estimated maximum possible concentrations. The ion abundance ratios for these compounds were outside the method-specified criteria, but were within Region III expanded criterion of ± 25 percent. These substituted isomer are considered to be presents, and are qualified "J".

Sample Number	Parameter
SJS05-SS53-00-03D	2,3,7,8-TCDF, 1,2,3,4,7,8-HxCDD, 2,3,4,6,7,8-HxCDF

12.0 QUANTITATION/REPORTING LIMITS

The positive results reported for 2, 3, 7, 8-TCDF for samples SJS05-SS44-00-03D, SJS05-SS50-00-03D, SJS05-SS50-00-03D-P, and SJS05-SS66-00-03D should be considered quantitative estimates. Poor precision was observed for this isomer on the dual chromatographic columns used for sample analysis. As required by USEPA protocol, the laboratory for reporting purposes used the lower concentration for these compounds. The results for 2, 3, 7, 8-TCDF have been marked with "J" qualifiers to indicate that they are quantitative estimates.

As required by USEPA protocol, all compounds, which were qualitatively identified at concentrations below their respective Quantitation Limits (QLs), have been marked with "J" qualifiers to indicate that they are quantitative estimates.

Project: St. Julien's Creek (CTO-24)
Laboratory: Mitkem Corporation, Warwick, Rhode Island
Sample Delivery Group: B1907
Fraction: Organic
Matrix: Soil
Report Date: 2/27/2004

This analytical quality assurance report is based upon a review of analytical data generated for soil samples. The sample locations, laboratory identification numbers, sample collection dates, sample matrix, and analyses performed are presented in Table 1.

The samples were analyzed for semivolatile organic compounds and pesticide/PCB constituents. The sample analyses were performed in accordance with the procedures outlined in the OLM03 USEPA Contract Laboratory Program (CLP) Statement of Work for Organic) Analysis.

All sample analyses have undergone an analytical quality assurance review to ensure adherence to the required protocols. Results have been validated or qualified according to general guidance provided in the Region III modifications to "Laboratory Data Validation Functional Guidelines for Validating Organic Analyses", USEPA 9/94. This document specifies procedures for validating data generated for CLP analyses. Therefore, the quality control requirements specified in the methods and associated acceptance criteria were also used to evaluate the non-CLP data. The parameters presented on the following page were evaluated.

X	•	Data Completeness
X	•	Chain of Custody Documentation
X	•	Holding Times
X	•	Instrument Performance
X	•	Initial and Continuing Calibrations
X	•	Laboratory and Field Blank Analysis Results
X	•	Surrogate Compound Recoveries
X	•	Matrix Spike/Matrix Spike Duplicate Recoveries and Reproducibility
	•	Field Duplicate Analysis Results
X	•	Laboratory Control Sample Results
X	•	Internal Standard Performance
X	•	Qualitative Identification
X	•	Quantitation/Reporting Limits

X - Denotes parameter evaluated.

It is recommended that the data only be used according to the qualifiers presented, and discussed in this report. All other data should be considered qualitatively and quantitatively valid as reported by the laboratory, based on the items evaluated.

Report Approved By:

Shawne M. Rodgers
President

2/27/2004
Date

1.0 *DATA COMPLETENESS*

The data deliverables were complete.

2.0 *CHAIN OF CUSTODY DOCUMENTATION*

The chain of custody documentation was complete.

3.0 *HOLDING TIMES*

All criteria were met. No qualifiers were applied.

4.0 *INSTRUMENT PERFORMANCE*

All criteria were met. No qualifiers were applied.

5.0 *INITIAL AND CONTINUING CALIBRATIONS*

All criteria were met. No qualifiers were applied.

6.0 *LABORATORY AND FIELD BLANK ANALYSIS RESULTS*

All criteria were met. No qualifiers were applied.

7.0 *SURROGATE COMPOUNDS*

All criteria were met. No qualifiers were applied.

8.0 *MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERIES AND REPRODUCIBILITY*

All criteria were met. No qualifiers were applied.

9.0 *FIELD DUPLICATE RESULTS*

Duplicate samples SJS05-SS42-00-03D and SJS05-SS42-00-03D-P were submitted to the laboratory to evaluate sampling and analytical precision for those organic compounds determined to be present. Results for these duplicate samples are presented in Table 2. Precision is evaluated by calculating the relative percent difference (%RPD) between duplicate pair results. There are no USEPA-established acceptance criteria for field duplicate samples. EDQ uses internal acceptance criteria of thirty percent for volatile detected compounds (and 40 percent for extractable compounds) to evaluate soil field duplicate samples.

10.0 *LABORATORY CONTROL SAMPLE RESULTS*

All criteria were met. No qualifiers were applied.

11.0 *INTERNAL STANDARD PERFORMANCE*

All criteria were met. No qualifiers were applied.

12.0 *QUALITATIVE IDENTIFICATION*

All criteria were met. No qualifiers were applied.

13.0 *QUANTITATION/REPORTING LIMITS*

The positive results reported for the pesticide/PCB constituents for the following samples should be considered quantitative estimates. Poor precision was observed for these compounds on the dual chromatographic columns used for sample analysis. As required by USEPA protocol, the laboratory for reporting purposes used the lower concentration for these compounds. The results for the pesticide compounds have been marked with "J" qualifiers to indicate that they are quantitative estimates.

Sample	Qualified Results
SJS05-SS41-00-03D	4, 4'-DDE, 4, 4'-DDT
SJS05-SS42-00-03D-P	4, 4'-DDT
SJS05-SS54-00-03D	4, 4'-DDD
SJS05-SS58-00-03D	4, 4'-DDE
SJS05-SS60-00-03D	4, 4'-DDT
SJS05-SS61-00-03D	4, 4'-DDD, 4, 4'-DDT

The following samples were re-analyzed for pesticide/PCB constituents. The dilution analyses were performed because pesticide/PCB constituents exceeded the linear range of the GC instrument. The results for the affected compounds have been reported from the diluted analysis. All other results for pesticide/PCB constituents have been reported from the initial analyses.

Sample	Dilution Factor	Compounds Reported From Dilution
SJS05-SS54-00-03D	5.0	4,4'-DDE
SJS05-SS60-00-03D	100	4,4'-DDT
SJS05-SS57-00-03D	5.0	4,4'-DDE, 4,4'-DDT
SJS05-SS59-00-03D	100	4,4'-DDE
SJS05-SS60-00-03D	5.0	4,4'-DDE
SJS05-SS61-00-03D	10.0	4,4'-DDE

As required by AFCEE protocol, all analytes that were qualitatively identified at concentrations below their respective reporting limit but above the method detection limit have been marked with "F" qualifiers to indicate that they are quantitative estimates.

METHODOLOGY REFERENCES

Analysis	Reference
Volatile Organic Compounds	Method 8260B, "Test Methods for Evaluating Solid Wastes", SW-846, third edition, Promulgated Updates II, IIA, and III, June 1997
Semivolatile Organic Compounds	Method 8270C, "Test Methods for Evaluating Solid Wastes", SW-846, third edition, Promulgated Updates II, IIA, and III, June 1997
Pesticide Compounds	Method 8081A, "Test Methods for Evaluating Solid Wastes", SW-846, third edition, Promulgated Updates II, IIA, and III, June 1997
Polychlorinated Biphenyl Constituents	Method 8082, "Test Methods for Evaluating Solid Wastes", SW-846, third edition, Promulgated Updates II, IIA, and III, June 1997

Table 2 Field Duplicate Sample Results for Organic Analyses
Duplicate Samples SJS05-SS42-00-03D and SJS05-SS42-00-03D-P

	SJS05-SS42-00-03D (µg/Kg)		SJS05-SS42-00-03D-P (µg/Kg)		RPD	Comments
Acenaphtylene	52	J	ND		NC	
Fluoranthene	75	J	61	J	20.6	
Pyrene	85	J	57	J	39.4	
Benzo (a) anthracene	96	J	56	J	52.6	
Chrysene	130	J	93	J	33.2	
Benzo (b) fluoranthene	200	J	120	J	50.0	
Benzo (k) fluoranthene	58	J	52	J	10.9	
Benzo (a) pyrene	120	J	ND			
Indeno (1, 2, 3-cd) pyrene	96	J	53	J	57.7	
4, 4'-DDE	110		18		143.8	
4, 4'-DDT	140		9.3	J	175.1	

Project: St. Julien's Creek (CTO-24)
Laboratory: Mitkem Corporation, Warwick, Rhode Island
Sample Delivery Group: B1898
Fraction: Organic
Matrix: Stormwater
Report Date: 2/27/2004

This analytical quality assurance report is based upon a review of analytical data generated for stormwater samples. The sample locations, laboratory identification numbers, sample collection dates, sample matrix, and analyses performed are presented in Table 1.

The samples were analyzed for volatile organic compounds. The sample analyses were performed in accordance with the procedures outlined in the OLC02 USEPA Contract Laboratory Program (CLP) Statements of Work for Organic Analysis.

All sample analyses have undergone an analytical quality assurance review to ensure adherence to the required protocols. Results have been validated or qualified according to general guidance provided in the Region III modifications to "Laboratory Data Validation Functional Guidelines for Validating Organic Analyses", USEPA 9/94. This document specifies procedures for validating data generated for CLP analyses. Therefore, the quality control requirements specified in the methods and associated acceptance criteria were also used to evaluate the non-CLP data. The parameters presented on the following page were evaluated.

X	•	Data Completeness
X	•	Chain of Custody Documentation
X	•	Holding Times
X	•	Instrument Performance
X	•	Initial and Continuing Calibrations
X	•	Laboratory and Field Blank Analysis Results
X	•	Surrogate Compound Recoveries
X	•	Matrix Spike/Matrix Spike Duplicate Recoveries and Reproducibility
X	•	Field Duplicate Analysis Results
X	•	Laboratory Control Sample Results
X	•	Internal Standard Performance
X	•	Qualitative Identification
X	•	Quantitation/Reporting Limits

X - Denotes parameter evaluated.

It is recommended that the data only be used according to the qualifiers presented, and discussed in this report. All other data should be considered qualitatively and quantitatively valid as reported by the laboratory, based on the items evaluated.

Report Approved By:

Shawne M. Rodgers
President

2/27/2004
Date

1.0 DATA COMPLETENESS

The data deliverables were complete.

2.0 CHAIN OF CUSTODY DOCUMENTATION

The chain of custody documentation was complete.

3.0 HOLDING TIMES

All criteria were met. No qualifiers were applied.

4.0 INSTRUMENT PERFORMANCE

All criteria were met. No qualifiers were applied.

5.0 INITIAL AND CONTINUING CALIBRATIONS

All criteria were met. No qualifiers were applied.

6.0 LABORATORY AND FIELD BLANK ANALYSIS RESULTS

The methylene chloride results for samples SJS02-ST01-03D, SJS02-ST01-03D-P, SJS02-ST02-03D, SJS02-ST03-03D, SJS02-ST04-03D, SJS02-ST05-03D, SJS02-ST06-03D, and SJS02-SW10-03D are qualitatively invalid due to the presence of these compounds in associated field and laboratory method blanks. USEPA Region III protocol requires positive results for common contaminants, such as methylene chloride, that are less than or equal to ten times the associated blank contamination level, to be considered qualitatively invalid. Placing "B" qualifiers next to these quantitative results for these samples has indicated this.

7.0 *SURROGATE COMPOUNDS*

Positive results for cis-1, 2-dichloroethene for sample SJS02-ST05-03D should be considered a biased low quantitative estimate, and may be higher than reported. Nondetected results for volatile compounds trans-1, 2-dichloroethene has been rejected, and should be considered suspect. The associated reiterated monitoring compound recovery was less than 20 percent. The low recovery indicates the possibility of severe analytical inefficiencies for this sample. The trans-1, 2-dichloroethene quantitation limit has been have been marked "R" to indicate that it is suspect.

Nondetected results for volatile compounds trans-1, 2-dichloroethene for sample SJS02-ST01-03D-P should be considered estimates, and may be higher than reported. A low recovery was obtained for the associated deuterated monitoring. The low recoveries indicate the possibility of analytical inefficiencies for this sample. The quantitation limit for this compound has been marked "UJ" to indicate that it is an estimate.

8.0 *MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERIES AND REPRODUCIBILITY*

All criteria were met. No qualifiers were applied.

9.0 *FIELD DUPLICATE RESULTS*

Duplicate samples SJS02-ST01-03D and SJS02-ST01-03D-P were submitted to the laboratory to evaluate sampling and analytical precision for those organic compounds determined to be present. Results for these duplicate samples are presented in Table 2. Precision is evaluated by calculating the relative percent difference (%RPD) between duplicate pair results. There are no USEPA-established acceptance criteria for field duplicate samples. EDQ uses internal acceptance criteria of twenty percent for volatile detected compounds to evaluate stormwater field duplicate samples.

10.0 LABORATORY CONTROL SAMPLE RESULTS

All criteria were met. No qualifiers were applied.

11.0 INTERNAL STANDARD PERFORMANCE

All criteria were met. No qualifiers were applied.

12.0 QUALITATIVE IDENTIFICATION

All criteria were met. No qualifiers were applied.

13.0 QUANTITATION/REPORTING LIMITS

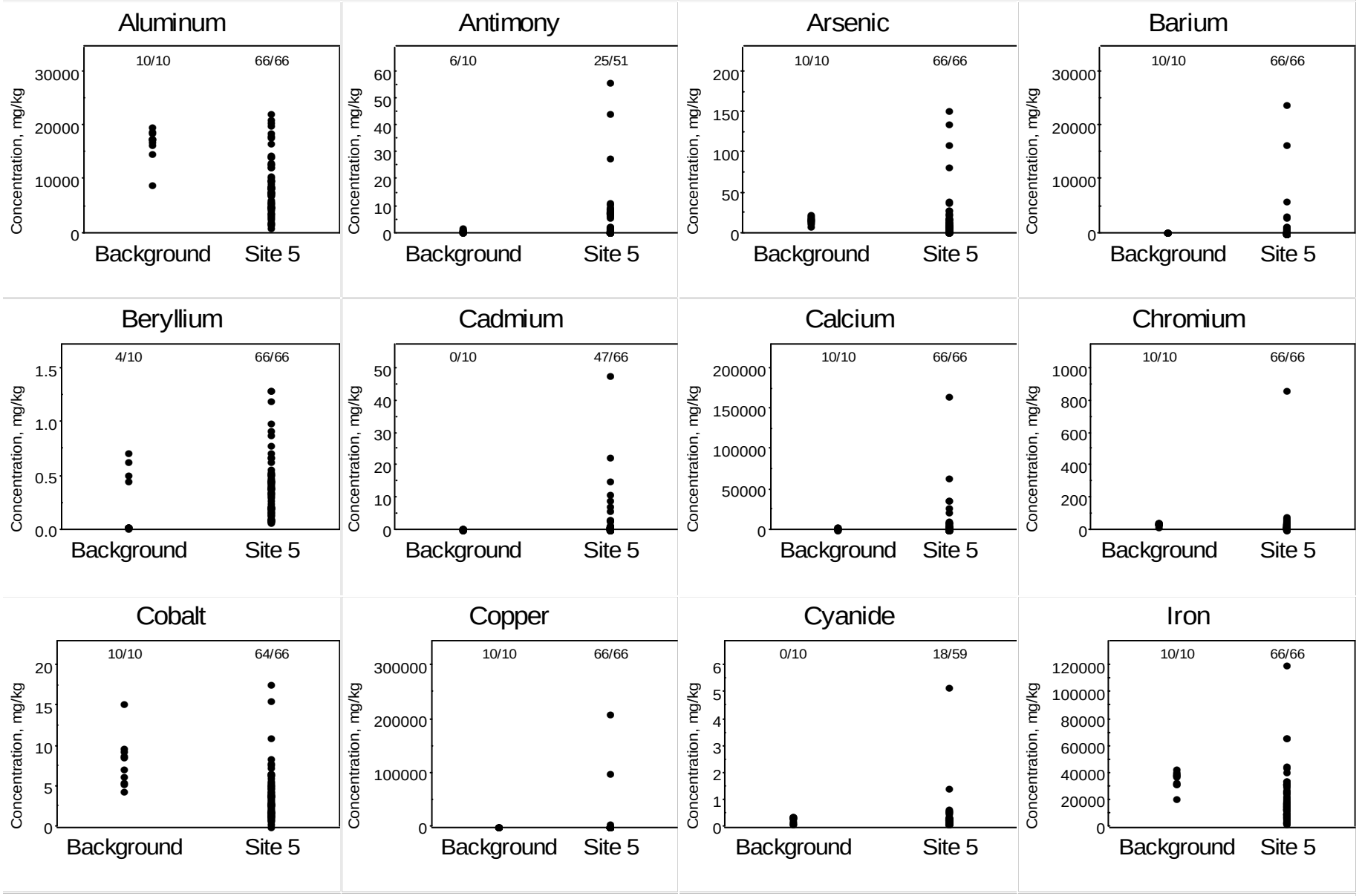
The following samples were re-analyzed at dilutions for volatile organic compound. The dilution analyses were performed because volatile organic compound exceeded the linear range of the GC instrument. The results for the affected compounds have been reported from the diluted analysis. All other results for volatile organic compound have been reported from the initial analyses.

Sample	Dilution Factor	Compounds Reported From Dilution
SJS02-ST01-03D	10.0	Trichloroethene
SJS02-ST01-03D-P	10.0	Trichloroethene
SJS02-ST03-03D	10.0	Trichloroethene
SJS02-ST04-03D	5.0	Trichloroethene
SJS02-ST07-03D	2.0	Trichloroethene
SJS02-SW10-03D	10.0	Trichloroethene
SJS02-SW11-03D	2.0	Trichloroethene

As required by EPA protocol, all compounds that were qualitatively identified at concentrations below their respective Contract Required Quantitation Limits (CRQLs) have been reported with "J" qualifiers on the data summary tables to indicate that they are quantitative estimates.

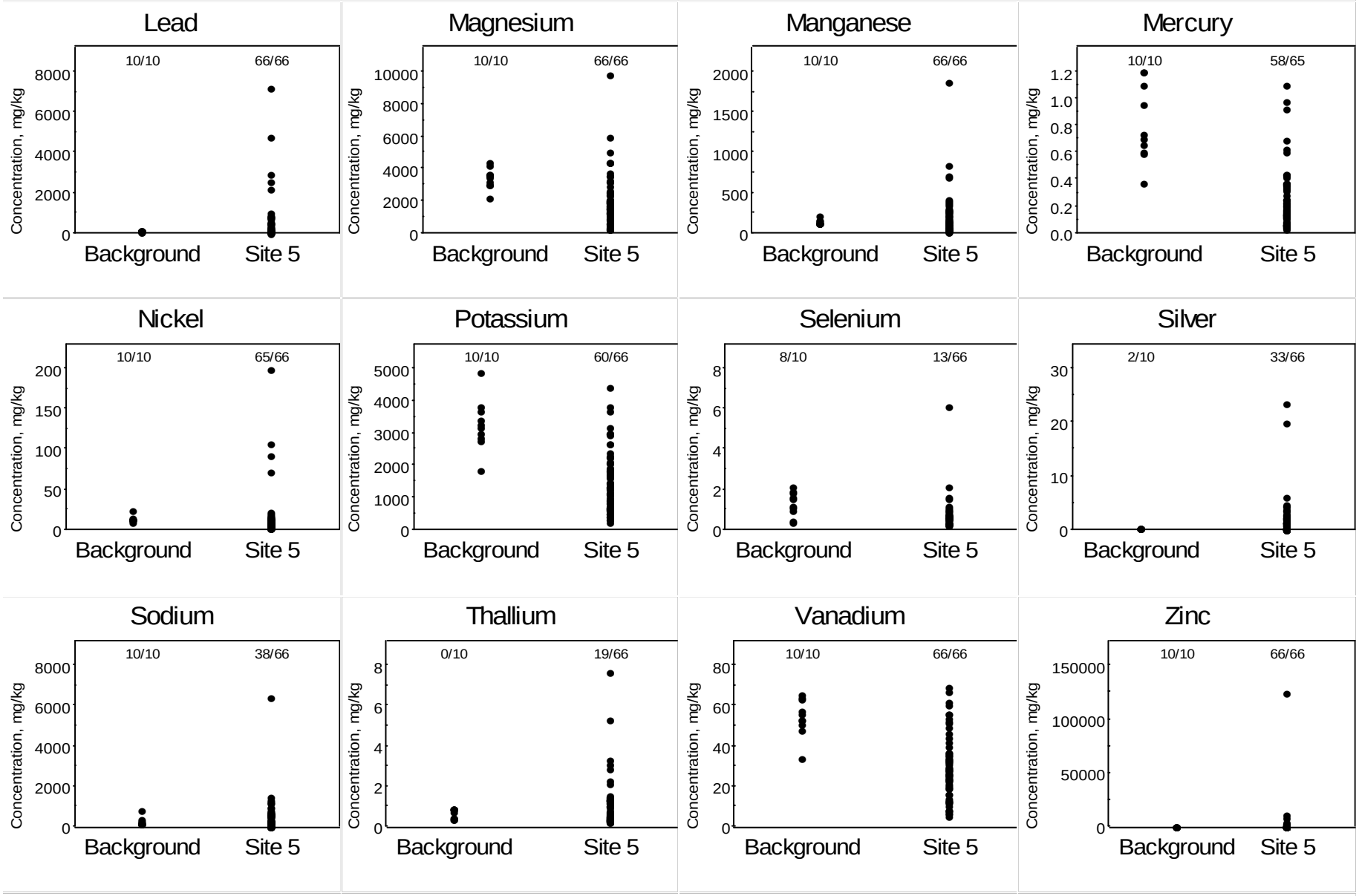
Appendix C

Figure 1: Scatter Plot Comparison of Site 5 Data to Background Data (Surface Soil)



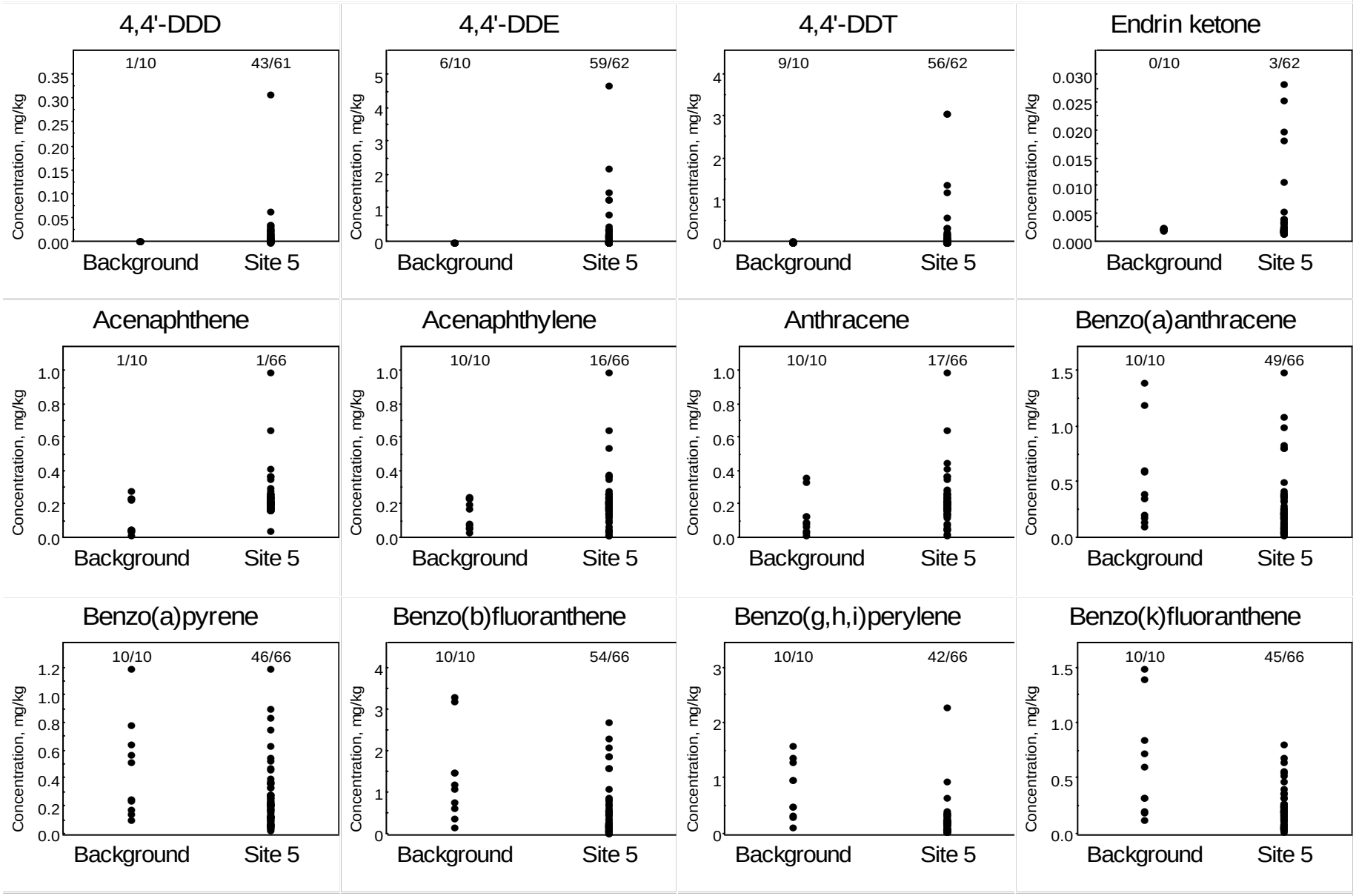
Open Symbol Represents Proxy for Nondetect (1/2 Detection Limit)

Figure 1: Scatter Plot Comparison of Site 5 Data to Background Data (Surface Soil)



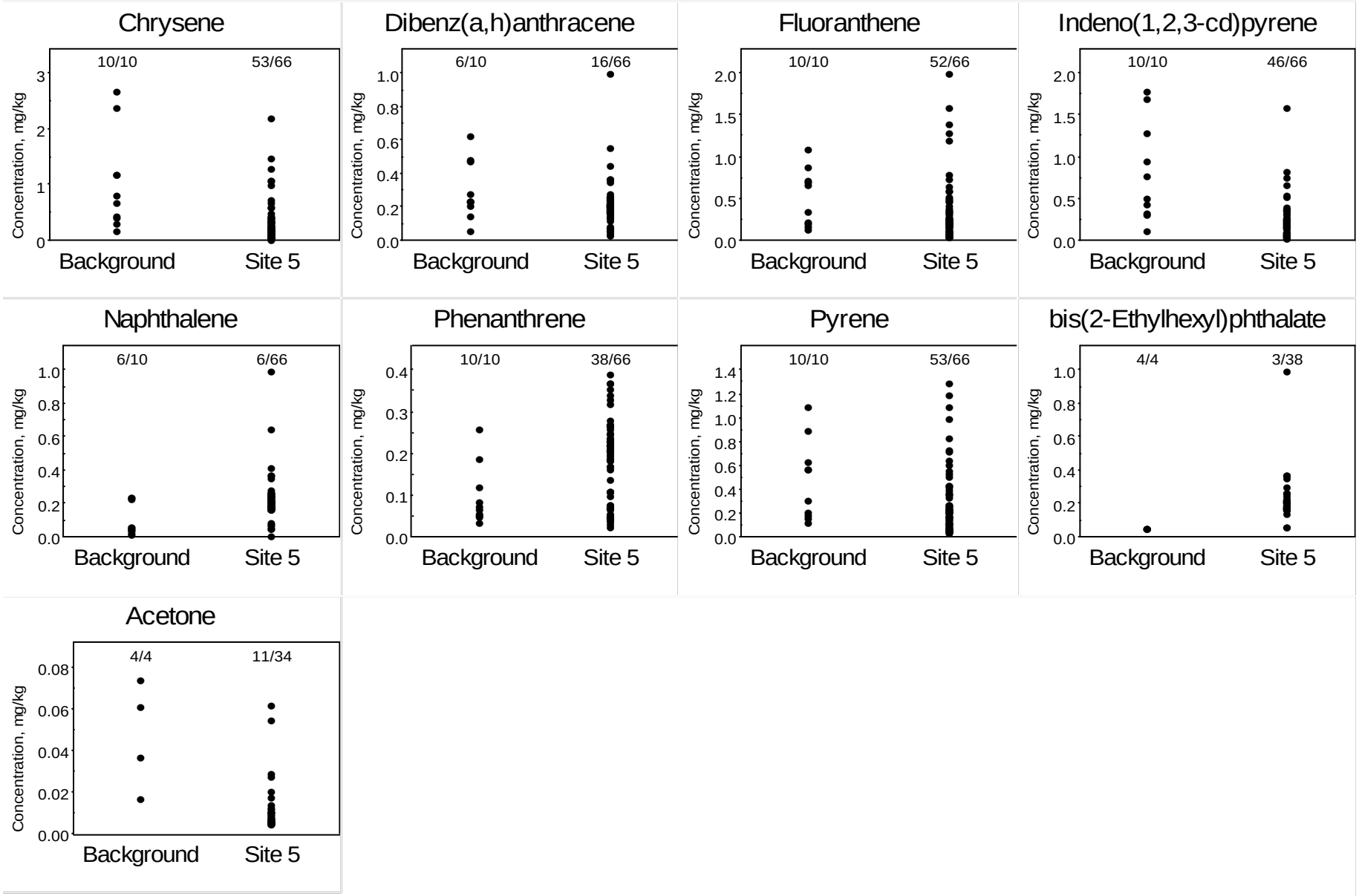
Open Symbol Represents Proxy for Nondetect (1/2 Detection Limit)

Figure 2: Scatter Plot Comparison of Site 5 Data to Background Data (Surface Soil)



Open Symbol Represents Proxy for Nondetect (1/2 Detection Limit)

Figure 2: Scatter Plot Comparison of Site 5 Data to Background Data (Surface Soil)



Open Symbol Represents Proxy for Nondetect (1/2 Detection Limit)

Figure 3: Box and Whisker Plot Comparison of Site 5 Data to Background Data (Surface Soil)

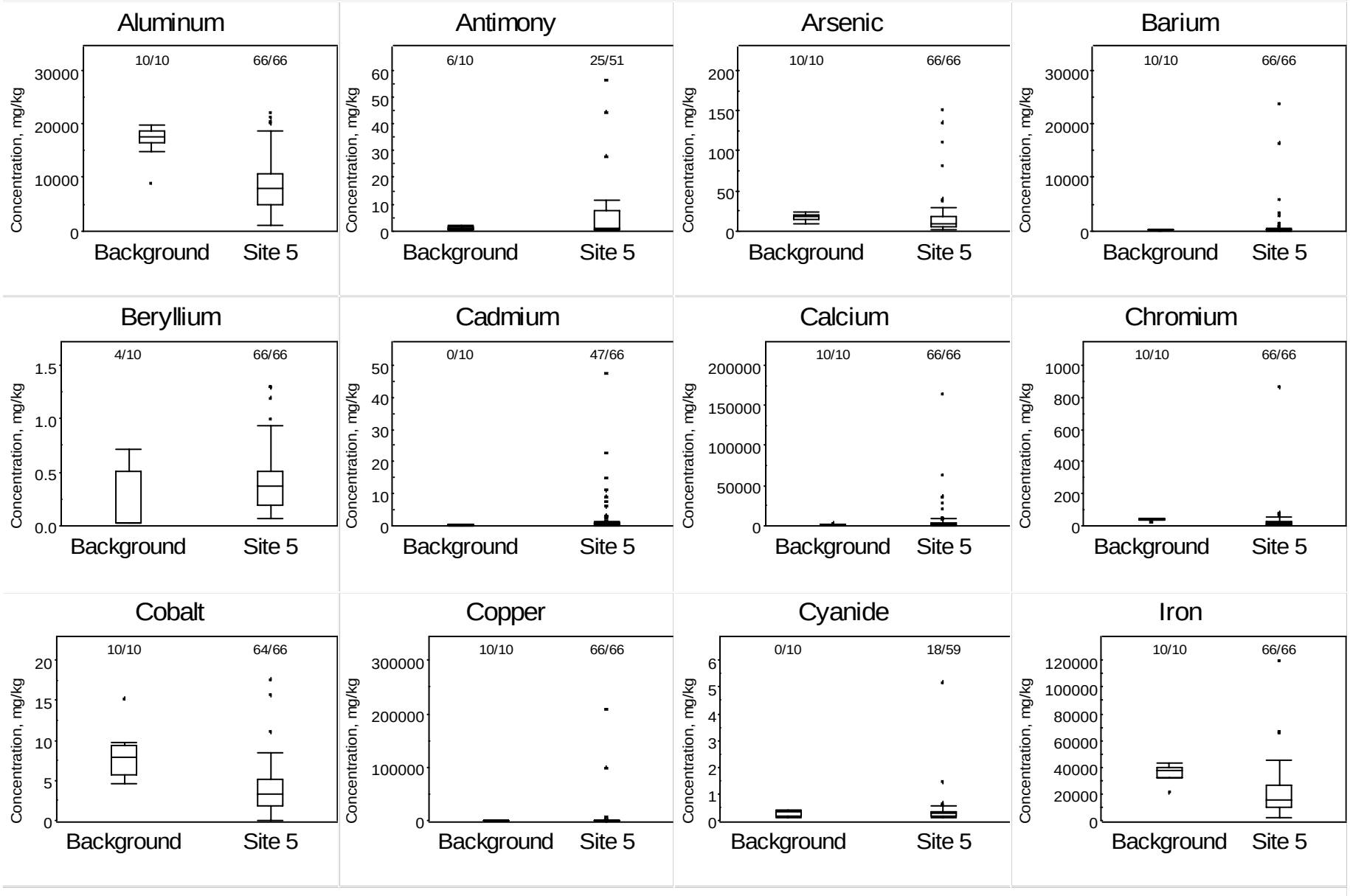


Figure 3: Box and Whisker Plot Comparison of Site 5 Data to Background Data (Surface Soil)

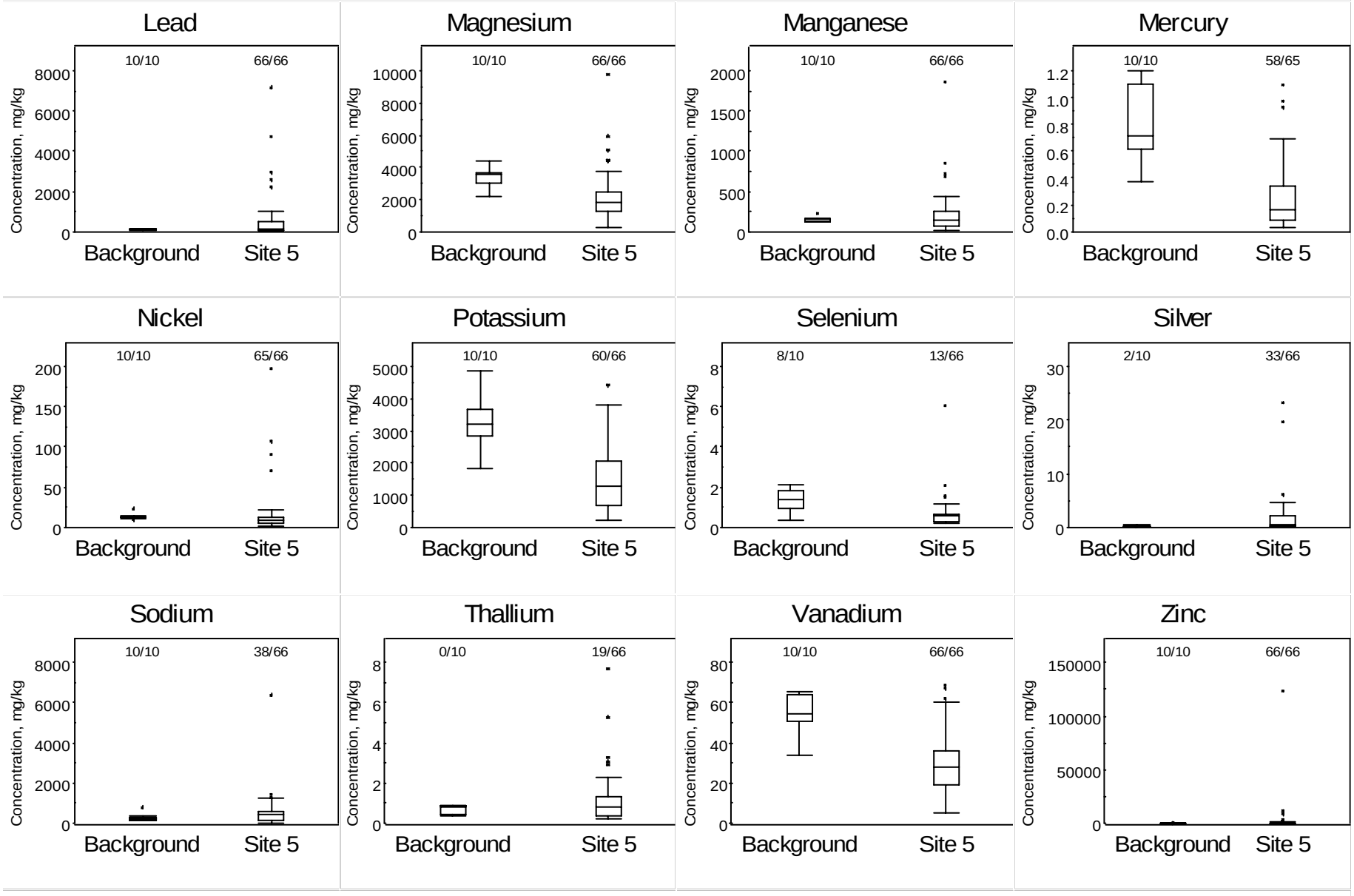


Figure 4: Box and Whisker Plot Comparison of Site 5 Data to Background Data (Surface Soil)

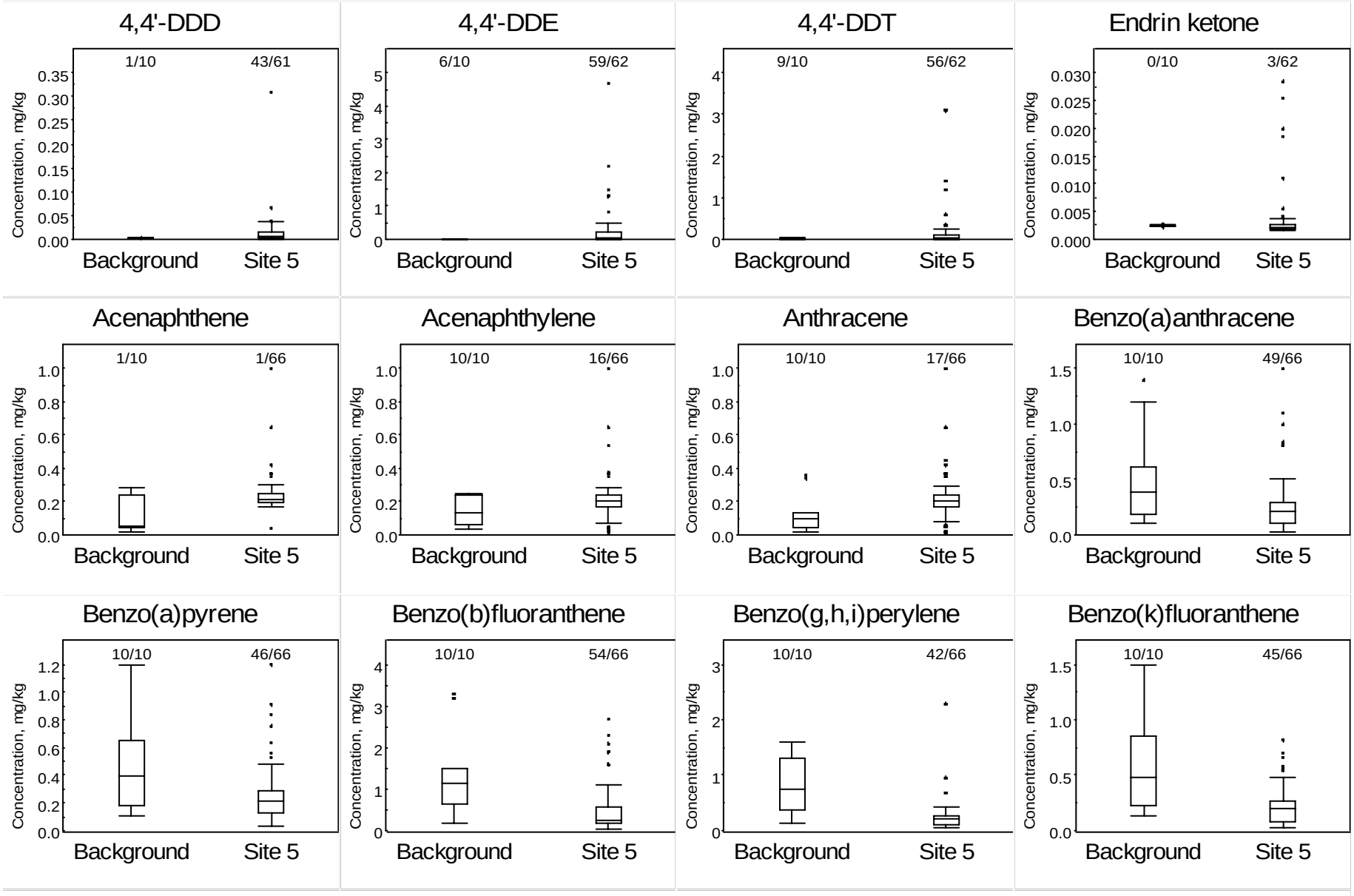
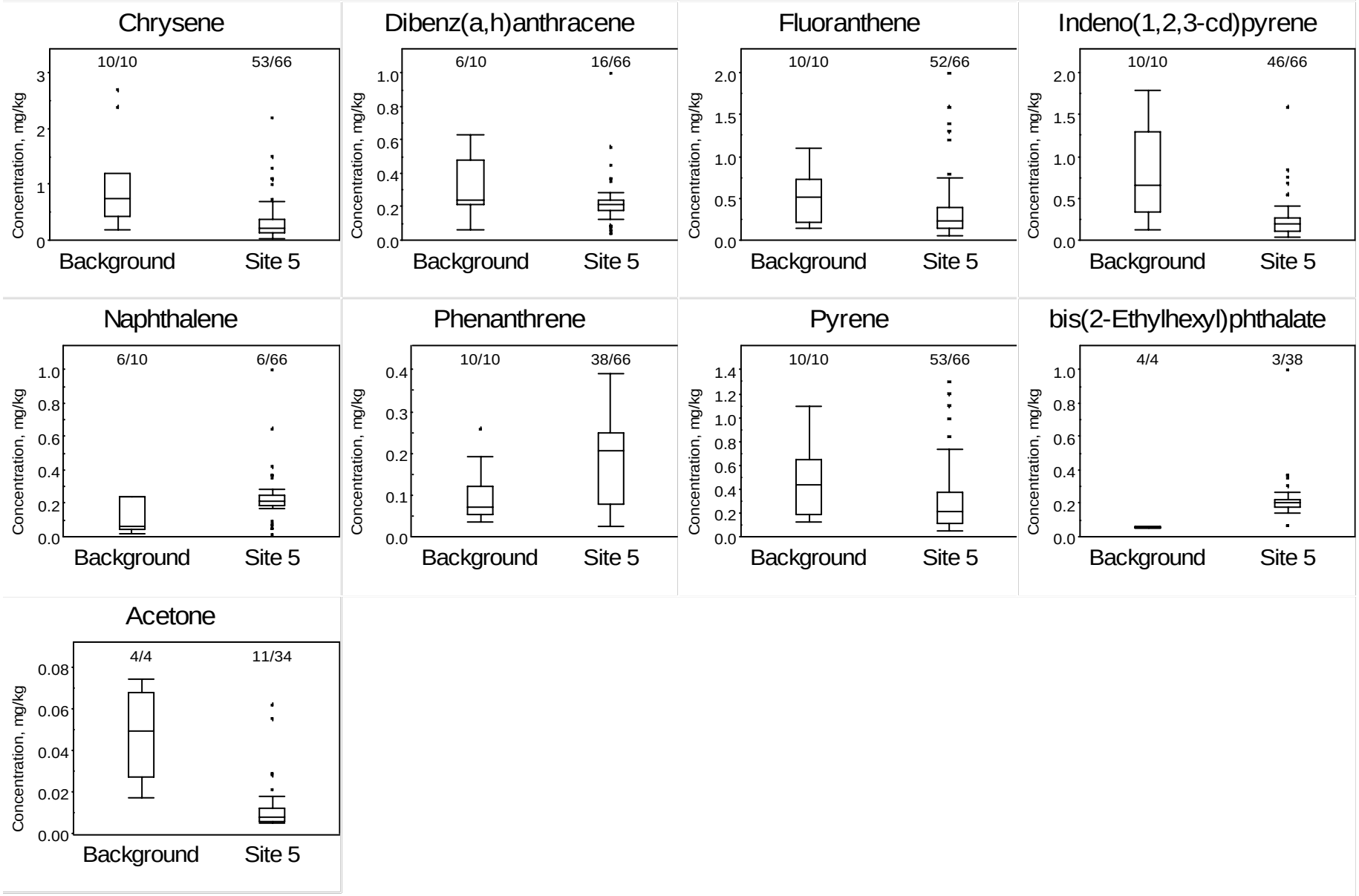


Figure 4: Box and Whisker Plot Comparison of Site 5 Data to Background Data (Surface Soil)



Appendix D

Table C-1
Central Tendency Population-to Population Comparisons
Between Site and Background Dredge Fill Surface Soil
Site 5 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

Parameter	Assumed Distribution for Comparison	p-value	Site Statistically Different from Background?	Background Detection Frequency	Site 5 Detection Frequency	Number of Detected Site Results Above Background UTLs	Number of Non-Detected Site Results Above Background UTLs
Semivolatile Organic Compounds							
Endrin ketone	Nonparametric	0.931	No @	0/10	3/62	*	*
Acenaphthene	Nonparametric	0.024	Yes #	1/10	1/66	0	7
Acenaphthylene	Nonparametric	0.074	Yes #	10/10	16/66	2	50
Anthracene	Nonparametric	0.007	Yes	10/10	17/66	0	16
Benzo(a)anthracene	Nonparametric	0.976	No	10/10	49/66	0	0
Benzo(a)pyrene	Nonparametric	0.977	No	10/10	46/66	0	0
Benzo(b)fluoranthene	Nonparametric	0.999	No	10/10	54/66	0	0
Benzo(g,h,i)perylene	Nonparametric	1.000	No	10/10	42/66	1	0
Benzo(k)fluoranthene	Nonparametric	0.998	No	10/10	45/66	0	0
Chrysene	Nonparametric	0.999	No	10/10	53/66	0	0
Dibenz(a,h)anthracene	Nonparametric	0.960	No	6/10	16/66	0	3
Fluoranthene	Nonparametric	0.963	No	10/10	52/66	0	0
Indeno(1,2,3-cd)pyrene	Nonparametric	1.000	No	10/10	46/66	0	0
Naphthalene	Nonparametric	0.004	Yes	6/10	6/66	0	17
Phenanthrene	Nonparametric	0.008	Yes	10/10	38/66	0	0
Pyrene	Nonparametric	0.965	No	10/10	53/66	0	0
bis(2-Ethylhexyl)phthalate	Nonparametric	0.001	Yes #	4/4	3/38	*	*
Pesticides							
4,4'-DDD	Nonparametric	0.020	Yes	1/10	43/61	26	5
4,4'-DDE	Nonparametric	0.000	Yes	6/10	59/62	46	0
4,4'-DDT	Nonparametric	0.024	Yes	9/10	56/62	32	0
Metals							
Aluminum	Nonparametric	1.000	No	10/10	66/66	0	0
Antimony	Nonparametric	0.129	Yes	6/10	25/51	14	10
Arsenic	Nonparametric	0.987	No	10/10	66/66	10	0
Barium	Nonparametric	0.119	Yes	10/10	66/66	33	0
Beryllium	Nonparametric	0.034	Yes	4/10	66/66	3	0
Cadmium	Nonparametric	0.002	Yes	0/10	47/66	*	*
Calcium	Nonparametric	0.110	Yes	10/10	66/66	20	0
Chromium	Nonparametric	1.000	No	10/10	66/66	6	0
Cobalt	Nonparametric	1.000	No	10/10	64/66	2	0
Copper	Nonparametric	0.638	No	10/10	66/66	26	0
Cyanide	Nonparametric	0.764	No @	0/10	18/59	*	*
Iron	Nonparametric	1.000	No	10/10	66/66	3	0
Lead	Nonparametric	0.509	No	10/10	66/66	26	0
Magnesium	Nonparametric	1.000	No	10/10	66/66	3	0
Manganese	Nonparametric	0.606	No	10/10	66/66	22	0
Mercury	Nonparametric	1.000	No	10/10	58/65	0	0
Nickel	Nonparametric	0.991	No	10/10	65/66	6	0
Potassium	Nonparametric	1.000	No	10/10	60/66	0	0
Selenium	Nonparametric	0.999	No	8/10	13/66	1	1
Silver	Nonparametric	0.268	No	2/10	33/66	30	3
Sodium	Nonparametric	0.065	Yes	10/10	38/66	9	18
Thallium	Nonparametric	0.207	No @	0/10	19/66	*	*
Vanadium	Nonparametric	1.000	No	10/10	66/66	0	0
Zinc	Nonparametric	0.207	No	10/10	66/66	23	0

Notes:
p-value = probability that the observed differences would occur purely by chance
* No background UTL available
@ Detected results occur only in the site data (not in background), but the site data falls on average into background noise
# This decision is largely based on nondetect proxies

Table D-1
Surface Soil Analytical Results
Site 5 Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS05-SS01	SJS05-SS02	SJS05-SS03	SJS05-SS04	SJS05-SS05	SJS05-SS06	SJS05-SS07		SJS05-SS08	SJS05-SS09	SJS05-SS10	SJS05-SS11	SJS05-SS12	SJS05-SS13	SJS05-SS14	SJS05-SS15	SJS05-SS16	SJS05-SS17	SJS05-SS18	SJS05-SS19	SJS05-SS20
Sample ID	SJS05-SS01-000	SJS05-SS02-000	SJS05-SS03-000	SJS05-SS04-000	SJS05-SS05-000	SJS05-SS06-000	SJS05-SS07-000	SJS05-SS07-000P	SJS05-SS08-000	SJS05-SS09-000	SJS05-SS10-000	SJS05-SS11-000	SJS05-SS12-000	SJS05-SS13-000	SJS05-SS14-000	SJS05-SS15-000	SJS05-SS16-000	SJS05-SS17-000	SJS05-SS18-000	SJS05-SS19-000	SJS05-SS20-000
Sample Date	06/24/97	06/26/97	06/26/97	06/26/97	06/26/97	06/26/97	06/26/97	06/26/97	06/26/97	06/26/97	04/21/99	04/21/99	04/22/99	04/21/99	04/22/99	04/21/99	04/22/99	04/22/99	04/22/99	04/22/99	04/22/99
Chemical Name																					
Volatile Organic Compounds (UG/KG)																					
1,1,1-Trichloroethane	11 UJ	11 U	11 U	10 U	11 U	10 U	11 U	NA	10 U	11 U	13 U	12 U	16 U	12 U	16 U	10 U	13 U	15 U	22 U	14 U	16 U
1,1,2,2-Tetrachloroethane	11 UJ	11 U	11 UJ	10 U	11 U	10 U	11 U	NA	10 U	11 UJ	13 U	12 U	16 U	12 U	16 U	10 U	13 U	15 U	22 U	14 U	16 U
1,1,2-Trichloroethane	11 UJ	11 U	11 U	10 U	11 U	10 U	11 U	NA	10 U	11 U	13 U	12 U	16 U	12 U	16 U	10 U	13 U	15 U	22 U	14 U	16 U
1,1-Dichloroethane	11 UJ	11 U	11 U	10 U	11 U	10 U	11 U	NA	10 U	11 U	13 U	12 U	16 U	12 U	16 U	10 U	13 U	15 U	22 U	14 U	16 U
1,1-Dichloroethene	11 UJ	11 U	11 U	10 U	11 U	10 U	11 U	NA	10 U	11 U	13 U	12 U	16 U	12 U	16 U	10 U	13 U	15 U	22 U	14 U	16 U
1,2-Dichloroethane	11 UJ	11 U	11 U	10 U	11 U	10 U	11 U	NA	10 U	11 U	13 U	12 U	16 U	12 U	16 U	10 U	13 U	15 U	22 U	14 U	16 U
1,2-Dichloroethene (total)	11 UJ	11 U	11 U	10 U	11 U	10 U	11 U	NA	1 J	11 U	13 U	12 U	16 U	12 U	16 U	10 U	13 U	15 U	22 U	14 U	16 U
1,2-Dichloropropane	11 UJ	11 U	11 U	10 U	11 U	10 U	11 U	NA	10 U	11 U	13 U	12 U	16 U	12 U	16 U	10 U	13 U	15 U	22 U	14 U	16 U
2-Butanone	11 UJ	11 U	11 U	10 U	11 U	210	11 U	NA	10 U	28	13 U	12 U	16 U	12 U	16 U	10 U	13 U	15 U	22 U	14 U	16 U
2-Hexanone	11 UJ	11 U	11 UJ	10 U	11 U	10 U	11 U	NA	10 U	11 UJ	13 U	12 U	16 U	12 U	16 U	10 U	13 U	15 U	22 U	14 U	16 U
4-Methyl-2-pentanone	11 UJ	11 U	11 UJ	10 U	11 U	10 U	11 U	NA	10 U	11 UJ	13 U	12 U	16 U	12 U	16 U	10 U	13 U	15 U	22 U	14 U	16 U
Acetone	11 UJ	11 U	12 J	10 U	14 J	28	11 U	NA	11 J	18 J	13 U	12 U	16 U	12 U	62	10 U	13 U	15 U	22 U	14 U	16 U
Benzene	11 UJ	11 U	11 U	10 U	11 U	10 U	11 U	NA	10 U	11 U	13 U	12 U	16 U	12 U	16 U	10 U	13 U	15 U	22 U	14 U	16 U
Bromodichloromethane	11 UJ	11 U	11 U	10 U	11 U	10 U	11 U	NA	10 U	11 U	13 U	12 U	16 U	12 U	16 U	10 U	13 U	15 U	22 U	14 U	16 U
Bromoform	11 UJ	11 U	11 U	10 U	11 U	10 U	11 U	NA	10 U	11 U	13 U	12 U	16 U	12 U	16 U	10 U	13 U	15 U	22 U	14 U	16 U
Bromomethane	11 UJ	11 U	11 U	10 U	11 U	10 U	11 U	NA	10 U	11 U	13 U	12 U	16 U	12 U	16 U	10 U	13 U	15 U	22 U	14 U	16 U
Carbon disulfide	11 UJ	11 U	11 U	10 U	11 U	10 U	11 U	NA	10 U	11 U	13 U	12 U	16 U	12 U	16 U	10 U	13 U	15 U	11 B	14 U	16 U
Carbon tetrachloride	11 UJ	11 U	11 U	10 U	11 U	10 U	11 U	NA	10 U	11 U	13 U	12 U	16 U	12 U	16 U	10 U	13 U	15 U	22 U	14 U	16 U
Chlorobenzene	11 UJ	11 U	11 UJ	10 U	11 U	10 U	11 U	NA	10 U	11 UJ	13 U	12 U	16 U	12 U	16 U	10 U	13 U	15 U	22 U	14 U	16 U
Chloroethane	11 UJ	11 U	11 U	10 U	11 U	10 U	11 U	NA	10 U	11 U	13 U	12 U	16 U	12 U	16 U	10 U	13 U	15 U	22 U	14 U	16 U
Chloroform	11 UJ	11 U	11 U	10 U	11 U	10 U	11 U	NA	10 U	11 U	13 U	12 U	16 U	12 U	16 U	10 U	13 U	15 U	22 U	14 U	16 U
Chloromethane	11 UJ	11 U	11 U	10 U	11 U	10 U	11 U	NA	10 U	11 U	13 U	12 U	16 U	12 U	16 U	10 U	13 U	15 U	22 U	14 U	16 U
Dibromochloromethane	11 UJ	11 U	11 U	10 U	11 U	10 U	11 U	NA	10 U	11 U	13 U	12 U	16 U	12 U	16 U	10 U	13 U	15 U	22 U	14 U	16 U
Ethylbenzene	11 UJ	11 U	11 UJ	10 U	11 U	10 U	11 U	NA	10 U	11 UJ	13 U	12 U	16 U	12 U	16 U	10 U	13 U	15 U	22 U	14 U	16 U
Methylene chloride	56 B	13 B	44 B	22 B	65 B	18 B	120	NA	59 B	48 B	12 B	7 B	171	2 B	49 B	7 B	33 B	45	67	30 B	162
Styrene	11 UJ	11 U	11 UJ	10 U	11 U	10 U	11 U	NA	10 U	11 UJ	13 U	12 U	16 U	12 U	16 U	10 U	13 U	15 U	22 U	14 U	16 U
Tetrachloroethene	11 UJ	11 U	11 UJ	10 U	2 J	10 U	11 U	NA	1 J	4 J	13 U	12 U	16 U	12 U	16 U	10 U	13 U	15 U	22 U	14 U	16 U
Toluene	11 UJ	11 U	11 UJ	10 U	2 J	2 J	11 U	NA	3 J	5 J	13 U	12 U	16 U	12 U	16 U	10 U	13 U	15 U	22 U	14 U	16 U
Trichloroethene	11 UJ	11 U	11 U	10 U	11 U	10 U	11 U	NA	10 U	11 U	13 U	12 U	16 U	12 U	16 U	10 U	13 U	15 U	22 U	14 U	2 J
Vinyl chloride	11 UJ	11 U	11 U	10 U	11 U	10 U	11 U	NA	10 U	11 U	13 U	12 U	16 U	12 U	16 U	10 U	13 U	15 U	22 U	14 U	16 U
Xylene, total	11 UJ	11 U	11 UJ	10 U	3 J	10 U	11 U	NA	10 U	11 UJ	13 U	12 U	16 U	12 U	16 U	10 U	13 U	15 U	22 U	14 U	16 U
cis-1,3-Dichloropropene	11 UJ	11 U	11 U	10 U	11 U	10 U	11 U	NA	10 U	11 U	13 U	12 U	16 U	12 U	16 U	10 U	13 U	15 U	22 U	14 U	16 U
trans-1,3-Dichloropropene	11 UJ	11 U	11 U	10 U	11 U	10 U	11 U	NA	10 U	11 U	13 U	12 U	16 U	12 U	16 U	10 U	13 U	15 U	22 U	14 U	16 U
Semivolatile Organic Compounds (UG/KG)																					
1,2,4-Trichlorobenzene	350 U	370 U	2,000 U	350 U	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
1,2-Dichlorobenzene	350 U	370 U	2,000 U	350 U	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
1,3-Dichlorobenzene	350 U	370 U	2,000 U	350 U	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
1,4-Dichlorobenzene	350 U	370 U	2,000 U	350 U	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
2,2'-Oxybis(1-chloropropane)	350 U	370 U	2,000 U	350 U	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
2,4,5-Trichlorophenol	880 U	930 U	5,000 U	880 U	900 U	830 U	920 U	NA	830 U	930 U	1,100 UJ	1,000 UJ	1,300 UJ	1,000 UJ	1,300 UJ	1,000 UJ	1,100 UJ	1,200 UJ	1,900 UJ	1,100 UJ	1,300 UJ
2,4,6-Trichlorophenol	350 U	370 U	2,000 U	350 U	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
2,4-Dichlorophenol	350 U	370 U	2,000 U	350 U	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
2,4-Dimethylphenol	350 U	370 U	2,000 U	350 U	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
2,4-Dinitrophenol	880 U	930 U	2,000 U	880 U	900 U	830 U	920 U	NA	830 U	930 U	1,100 UJ	1,000 UJ	1,300 UJ	1,000 UJ	1,300 UJ	1,000 UJ	1,100 UJ	1,200 UJ	1,900 UJ	1,100 UJ	1,300 UJ
2,4-Dinitrotoluene	580	370 U	3,200	180 J	340 J	330 U	280 J	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
2,6-Dinitrotoluene	39 J	370 U	2,000 U	350 U	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
2-Chloronaphthalene	350 U	370 U	2,000 U	350 U	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
2-Chlorophenol	350 U	370 U	2,000 U	350 U	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
2-Methylnaphthalene	42 J	370 U	2,000 U	350 U	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
2-Methylphenol	350 U	370 U	2,000 U	350 U	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
2-Nitroaniline	880 U	930 U	5,000 U	880 U	900 U	830 U	920 U	NA	830 U	930 U	1,100 UJ	1,000 UJ	1,300 UJ	1,000 UJ	1,300 UJ	1,000 UJ	1,100 UJ	1,200 UJ	1,900 UJ	1,100 UJ	1,300 UJ
2-Nitrophenol	350 U	370 U	2,000 U	350 U	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
3,3'-Dichlorobenzidine	350 U	370 U	2,000 U	350 U	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
3-Nitroaniline	880 U	930 U	5,000 U	880 U	900 U	830 U	920 U	NA	830 U	930 U	1,100 UJ	1,000 UJ	1,300 UJ	1,000 UJ	1,300 UJ	1,000 UJ	1,100 UJ	1,200 UJ	1,900 UJ	1,100 UJ	1,300 UJ
4,6-Dinitro-2-methylphenol	880 U	930 U	2,000 U	880 U	900 U	830 U	920 U	NA	830 U	930 U	1,100 UJ	1,000 UJ	1,300 UJ	1,000 UJ	1,300 UJ	1,000 UJ	1,100 UJ	1,200 UJ	1,900 UJ	1,100 UJ	1,300 UJ
4-Bromophenyl-phenylether	350 U	370 U	2,000 U	350 U	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
4-Chloro-3-methylphenol	350 U	370 U	2,000 U	350 U	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
4-Chloroaniline	350 U	370 U	2,000 U	350 U	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
4-Chlorophenyl-phenylether	350 U	370 U	2,000 U	350 U	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
4-Methylphenol	350 U	370 U	2,000 U	350 U	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
4-Nitroaniline	880 U	930 U	5,000 U	880 U	900 U	830 U	920 U	NA	830 U	930 U	1,100 UJ	1,000 UJ	1,300 UJ	1,000 UJ	1,300 UJ	1,000 UJ	1,100 UJ	1,200 UJ	1,900 UJ	1,100 UJ	1,300 UJ
4-Nitrophenol	880 U	930 U	5,000 U	880 U	900 U	830 U	920 U	NA	830 U	930 U	1,100 UJ	1,000 UJ	1,300 UJ	1,000 UJ	1,300 UJ	1,000 UJ	1,100 UJ	1,200 UJ	1,900 UJ	1,100 UJ	1,300 UJ
Acenaphthene	350 U	370 U	2,000 U	41 J	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
Acenaphthylene	350 U	47 J	2,000 U	350 U	360 U	35 J	44 J	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ

Table D-1
Surface Soil Analytical Results
Site 5 Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS05-SS01	SJS05-SS02	SJS05-SS03	SJS05-SS04	SJS05-SS05	SJS05-SS06	SJS05-SS07		SJS05-SS08	SJS05-SS09	SJS05-SS10	SJS05-SS11	SJS05-SS12	SJS05-SS13	SJS05-SS14	SJS05-SS15	SJS05-SS16	SJS05-SS17	SJS05-SS18	SJS05-SS19	SJS05-SS20
Sample ID	SJS05-SS01-000	SJS05-SS02-000	SJS05-SS03-000	SJS05-SS04-000	SJS05-SS05-000	SJS05-SS06-000	SJS05-SS07-000	SJS05-SS07-000P	SJS05-SS08-000	SJS05-SS09-000	SJS05-SS10-000	SJS05-SS11-000	SJS05-SS12-000	SJS05-SS13-000	SJS05-SS14-000	SJS05-SS15-000	SJS05-SS16-000	SJS05-SS17-000	SJS05-SS18-000	SJS05-SS19-000	SJS05-SS20-000
Sample Date	06/24/97	06/26/97	06/26/97	06/26/97	06/26/97	06/26/97	06/26/97	06/26/97	06/26/97	06/26/97	04/21/99	04/21/99	04/22/99	04/21/99	04/22/99	04/21/99	04/22/99	04/22/99	04/22/99	04/22/99	04/22/99
Chemical Name																					
Anthracene	54 J	370 U	2,000 U	51 J	360 U	330 U	49 J	NA	330 U	370 U	420 UJ	79 J	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
Benzo(a)anthracene	390	180 J	810 J	330 J	95 J	220 J	230 J	NA	37 J	400	420 UJ	380 J	540 UJ	51 J	530 UJ	420 UJ	110 J	170 J	740 UJ	56 J	540 UJ
Benzo(a)pyrene	390	140 J	480 J	290 J	73 J	120 J	190 J	NA	330 U	340 J	420 UJ	290 J	540 UJ	67 J	530 UJ	420 UJ	73 J	130 J	740 UJ	460 UJ	540 UJ
Benzo(b)fluoranthene	700	570	1,900 J	480	300 J	560	490	NA	92 J	1,100	420 UJ	650 J	540 UJ	110 J	530 UJ	420 UJ	160 J	260 J	740 UJ	74 J	540 UJ
Benzo(g,h,i)perylene	270 J	120 J	350 J	160 J	66 J	77 J	120 J	NA	330 U	230 J	420 UJ	250 J	540 UJ	60 J	530 UJ	420 UJ	72 J	110 J	740 UJ	460 UJ	540 UJ
Benzo(k)fluoranthene	140 J	200 J	700 J	220 J	76 J	150 J	200 J	NA	330 U	330 J	420 UJ	250 J	540 UJ	48 J	530 UJ	420 UJ	54 J	89 J	740 UJ	460 UJ	540 UJ
Butylbenzylphthalate	350 U	370 U	2,000 U	350 U	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
Carbazole	40 J	370 U	2,000 U	350 U	360 U	61 J	360 U	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
Chrysene	390	340 J	1,100 J	370	160 J	450	330 J	NA	56 J	610	420 UJ	410 J	540 UJ	49 J	530 UJ	420 UJ	160 J	180 J	740 UJ	62 J	540 UJ
Di-n-butylphthalate	180 J	370 U	4,700	38 J	210 J	330 U	160 J	NA	43 J	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	130 J	83 J	740 UJ	140 J	160 J
Di-n-octylphthalate	350 U	370 U	2,000 U	350 U	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
Dibenz(a,h)anthracene	350 U	370 U	2,000 U	61 J	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	80 J	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
Dibenzofuran	350 U	370 U	2,000 U	350 U	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
Diethylphthalate	350 U	370 U	2,000 U	350 U	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	420 UJ	170 J	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
Dimethyl phthalate	350 U	370 U	2,000 U	350 U	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	420 UJ	63 J	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
Fluoranthene	520	260 J	2,000 J	470	130 J	790	350 J	NA	63 J	500	420 UJ	660 J	540 UJ	57 J	530 UJ	420 UJ	180 J	230 J	740 UJ	84 J	540 UJ
Fluorene	350 U	370 U	2,000 U	350 U	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
Hexachlorobenzene	350 U	370 U	2,000 U	350 U	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
Hexachlorobutadiene	350 U	370 U	2,000 U	350 U	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
Hexachlorocyclopentadiene	350 U	370 U	2,000 U	350 U	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
Hexachloroethane	350 U	370 U	2,000 U	350 U	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
Indeno(1,2,3-cd)pyrene	270 J	160 J	540 J	170 J	81 J	110 J	150 J	NA	35 J	260 J	420 UJ	250 J	540 UJ	43 J	530 UJ	420 UJ	69 J	110 J	740 UJ	460 UJ	540 UJ
Isophorone	350 U	370 U	2,000 U	350 U	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
Naphthalene	50 J	370 U	2,000 U	350 U	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
Nitrobenzene	350 U	370 U	2,000 U	350 U	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
Pentachlorophenol	880 U	930 U	5,000 U	880 U	900 U	830 U	920 U	NA	830 U	930 U	1,100 UJ	1,000 UJ	1,300 UJ	1,000 UJ	1,300 UJ	1,000 UJ	1,100 UJ	1,200 UJ	1,900 UJ	1,100 UJ	1,300 UJ
Phenanthrene	270 J	70 J	260 J	330 J	57 J	230 J	250 J	NA	330 U	79 J	420 UJ	340 J	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	53 J	740 UJ	460 UJ	540 UJ
Phenol	350 U	370 U	2,000 U	350 U	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
Pyrene	510	220 J	730 J	610	130 J	560	420	NA	81 J	1,200	420 UJ	540 J	540 UJ	43 J	530 UJ	420 UJ	110 J	150 J	740 UJ	76 J	540 UJ
bis(2-Chloroethoxy)methane	350 U	370 U	2,000 U	350 U	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
bis(2-Chloroethyl)ether	350 U	370 U	2,000 U	350 U	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
bis(2-Ethylhexyl)phthalate	69 B	56 B	2,000 U	80 B	63 B	1,200 B	86 B	NA	140 B	130 B	420 UJ	420 UJ	180 J	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	66 J
n-Nitroso-di-n-propylamine	350 U	370 U	2,000 U	350 U	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
n-Nitrosodiphenylamine	120 J	370 U	530 J	150 J	360 U	330 U	360 U	NA	330 U	370 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	740 UJ	460 UJ	540 UJ
Pesticide/Polychlorinated Biphenyls (UG/KG)																					
4,4'-DDD	38 J	66 J	3.9 UJ	9	28 J	3.3 U	36	NA	3.3 U	310 J	4.20 UJ	31 J	3.90 J	4 UJ	1.40 J	4.20 UJ	2.60 J	15 J	7.40 UJ	4.5 UJ	5.30 UJ
4,4'-DDE	400	180	220	39	94	3.3 U	210	NA	3.8 J	2,200	13 J	230 J	1.40 J	1,500 J	3.30 J	3.10 J	18 J	49 J	7.40 UJ	4.5 UJ	0.530 J
4,4'-DDT	110	600	250	13 J	44 J	3.3 U	50	NA	3.3 U	1,200	5.70 J	42 J	4.90 J	340 J	3.70 J	2.60 J	2.20 J	7 J	7.40 UJ	4.5 UJ	5.30 UJ
Aldrin	1.8 U	1.9 U	2 UJ	1.8 U	1.8 U	1.7 U	1.9 U	NA	1.7 U	19 U	2.10 UJ	2.10 UJ	2.70 UJ	2 UJ	2.60 UJ	2.10 UJ	2.20 UJ	2.40 UJ	3.70 UJ	2.30 UJ	2.70 UJ
Aroclor-1016	35 U	37 U	39 UJ	35 U	36 U	33 U	36 U	NA	33 U	370 U	42 UJ	42 UJ	54 UJ	40 UJ	52 UJ	42 UJ	44 UJ	48 UJ	74 UJ	45 UJ	53 UJ
Aroclor-1221	71 U	76 U	79 UJ	72 U	73 U	67 U	73 U	NA	67 U	760 U	84 UJ	83 UJ	110 UJ	81 UJ	100 UJ	83 UJ	88 UJ	97 UJ	150 UJ	91 UJ	110 UJ
Aroclor-1232	35 U	37 U	39 UJ	35 U	36 U	33 U	36 U	NA	33 U	370 U	42 UJ	42 UJ	54 UJ	40 UJ	52 UJ	42 UJ	44 UJ	48 UJ	74 UJ	45 UJ	53 UJ
Aroclor-1242	35 U	37 U	39 UJ	35 U	36 U	33 U	36 U	NA	33 U	370 U	42 UJ	42 UJ	54 UJ	40 UJ	52 UJ	42 UJ	44 UJ	48 UJ	74 UJ	45 UJ	53 UJ
Aroclor-1248	35 U	37 U	39 UJ	35 U	36 U	33 U	36 U	NA	33 U	370 U	42 UJ	42 UJ	54 UJ	40 UJ	52 UJ	42 UJ	44 UJ	48 UJ	74 UJ	45 UJ	53 UJ
Aroclor-1254	35 U	37 U	39 UJ	35 U	36 U	33 U	36 U	NA	33 U	370 U	42 UJ	42 UJ	54 UJ	40 UJ	52 UJ	42 UJ	44 UJ	48 UJ	74 UJ	45 UJ	53 UJ
Aroclor-1260	35 U	30 J	39 UJ	35 U	36 U	33 U	36 U	NA	39	370 U	42 UJ	42 UJ	54 UJ	40 UJ	52 UJ	42 UJ	44 UJ	48 UJ	74 UJ	45 UJ	53 UJ
Dieldrin	3.5 U	5 J	3.9 UJ	3.5 U	3.6 U	3.3 U	3.6 U	NA	6.8	37 U	4.20 UJ	4.20 UJ	5.40 UJ	1.30 J	5.20 UJ	4.20 UJ	4.40 UJ	4.80 UJ	7.40 UJ	4.5 UJ	5.30 UJ
Endosulfan I	1.8 U	1.9 U	2 UJ	1.8 U	1.8 U	1.7 U	1.9 U	NA	1.7 U	19 U	2.10 UJ	2.10 UJ	2.70 UJ	2 UJ	2.60 UJ	2.10 UJ	2.20 UJ	2.40 UJ	3.70 UJ	2.30 UJ	2.70 UJ
Endosulfan II	3.5 U	3.7 U	3.9 UJ	3.5 U	3.6 U	3.3 U	3.6 U	NA	3.3 U	37 U	4.20 UJ	4.20 UJ	5.40 UJ	4 UJ	5.20 UJ	4.20 UJ	4.40 UJ	4.80 UJ	7.40 UJ	4.5 UJ	5.30 UJ
Endosulfan sulfate	3.5 U	3.7 U	3.9 UJ	3.5 U	3.6 U	3.3 U	3.6 U	NA	3.3 U	37 U	4.20 UJ	4.20 UJ	5.40 UJ	4 UJ	5.20 UJ	4.20 UJ	4.40 UJ	4.80 UJ	7.40 UJ	4.5 UJ	5.30 UJ
Endrin	3.5 U	3.7 U	3.9 UJ	3.5 U	3.6 U	3.3 U	3.6 U	NA	3.3 U	37 U	4.20 UJ	4.20 UJ	5.40 UJ	4 UJ	5.20 UJ	4.20 UJ	4.40 UJ	4.80 UJ	7.40 UJ	4.5 UJ	5.30 UJ
Endrin aldehyde	3.5 U	3.7 U	3.9 UJ	3.5 U	3.6 U	3.3 U	3.6 U	NA	3.3 U	37 U	4.20 UJ	4.20 UJ	5.40 UJ	4 UJ	5.20 UJ	4.20 UJ	4.40 UJ	4.80 UJ	7.40 UJ	4.5 UJ	5.30 UJ
Endrin ketone	3.5 U	3.7 U	3.9 UJ	3.5 U	3.6 U	3.3 U	3.6 U	NA	3.3 U	37 U	4.20 UJ	4.20 UJ	5.40 UJ	4 UJ	5.20 UJ	4.20 UJ	4.40 UJ	4.80 UJ	7.40 UJ	4.5 UJ	5.30 UJ
Heptachlor	1.8 U	1.9 U	2 UJ	1.8 U	1.8 U	1.7 U	1.9 U	NA	1.7 U	19 U	2.10 UJ	2.10 UJ	2.70 UJ	2 UJ	2.60 UJ	2.10 UJ	2.20 UJ	2.40 UJ	3.70 UJ	2.30 UJ	2.70 UJ
Heptachlor epoxide	1.8 U	1.9 U	2 UJ	1.8 U	1.8 U	1.7 U	1.9 U	NA	1.7 U	19 U	2.10 UJ	2.10 UJ	2.70 UJ	2 UJ	2.60 UJ	2.10 UJ	2.20 UJ	2.40 UJ	3.70 UJ	2.30 UJ	2.70 UJ
Methoxychlor	18 U	19 U	20 UJ	18 U	18 U	17 U	19 U	NA	17 U	190 U	21 UJ	21 UJ	27 UJ	20 UJ	26 UJ	21 UJ	22 UJ	24 UJ	37 UJ	23 UJ	27 UJ
Toxaphene	180 U	190 U	200 UJ	180 U	180 U	170 U	190 U	NA	170 U	1,900 U	210 UJ	210 UJ	270 UJ	200 UJ	260 UJ	210 UJ	220 UJ	240 UJ	370 UJ	230 UJ	270 UJ
alpha-BHC	1.8 U	1.9 U	2 UJ	1.8 U	1.8 U	1.7 U	1.9 U	NA	3.5	19 U	2.10 UJ	2.10 UJ	2.70 UJ	2 UJ	2.60 UJ	2.10 UJ	2.20 UJ	2.40 UJ	3.70 UJ	2.30 UJ	2.70 UJ
alpha-Chlordane	1.8 U	1.9 U	2 UJ	1.8 U	1.8 U	1.7 U	1.9 U	NA	2.4 J	19 U	2.10 UJ	0.580 J	2.70 UJ	2 UJ	2.60 UJ	2.10 UJ	2.20 UJ	2.40 UJ	3.70 UJ	2.30 UJ	2.70 UJ
beta-BHC	1.8 U	1.9 U	2 UJ	1.8 U	1.8 U	1.7 U	1.9 U	NA	1.7 U	19 U	2.10 UJ	2.10 UJ	2.70 UJ	2 UJ	2.60 UJ	2.10 UJ	2.20 UJ	2.40 UJ	3.70 UJ	2.30 UJ	2.70 UJ
delta-BHC	1.8 U	1.9 U	2 UJ	1.8 U	1.8 U	1.7 U	1.9 U	NA	1.7 U	19 U	2.10 UJ	2.10 UJ	2.70 UJ	2 UJ	2.60 UJ	2.10 UJ	2.20 UJ	2.40 UJ	3.70 UJ	2.30 UJ	2.70 UJ
gamma-BHC (Lindane)	1.8 U	1.9 U	2 UJ	1.8 U	1.8 U	1.7 U	1.9 U	NA	1.7 U	19 U	2.10 UJ	2.10 UJ	2.70 UJ	2 UJ	2.60 UJ	2.10 UJ	2.20 UJ	2.40 UJ	3.70 UJ	2.30 UJ	2.70 UJ
gamma-Chlordane	1.8 U	1.9 U	2 UJ	1.8 U	1.8 U	1.7 U	1.9 U	NA	2.6 J	19 U	2.10 UJ	2.10 UJ	2.70 UJ	2 UJ	2.60 UJ	2.10 UJ	2.20 UJ	2.40 UJ	3.70 UJ	2.30 UJ	2.70 UJ
Explosives (UG/KG)																					
1,3,5-Trinitrobenzene	NA	NA	NA	NA	NA	NA	530 U	540 U	NA	NA	238 U	250 U	250 U	250 U	250 U	238 U	238 U	238 U	250 U	250 U	250 U

Table D-1
Surface Soil Analytical Results
Site 5 Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS05-SS01	SJS05-SS02	SJS05-SS03	SJS05-SS04	SJS05-SS05	SJS05-SS06	SJS05-SS07		SJS05-SS08	SJS05-SS09	SJS05-SS10	SJS05-SS11	SJS05-SS12	SJS05-SS13	SJS05-SS14	SJS05-SS15	SJS05-SS16	SJS05-SS17	SJS05-SS18	SJS05-SS19	SJS05-SS20
Sample ID	SJS05-SS01-000	SJS05-SS02-000	SJS05-SS03-000	SJS05-SS04-000	SJS05-SS05-000	SJS05-SS06-000	SJS05-SS07-000	SJS05-SS07-000P	SJS05-SS08-000	SJS05-SS09-000	SJS05-SS10-000	SJS05-SS11-000	SJS05-SS12-000	SJS05-SS13-000	SJS05-SS14-000	SJS05-SS15-000	SJS05-SS16-000	SJS05-SS17-000	SJS05-SS18-000	SJS05-SS19-000	SJS05-SS20-000
Sample Date	06/24/97	06/26/97	06/26/97	06/26/97	06/26/97	06/26/97	06/26/97	06/26/97	06/26/97	06/26/97	04/21/99	04/21/99	04/22/99	04/21/99	04/22/99	04/21/99	04/22/99	04/22/99	04/22/99	04/22/99	04/22/99
Chemical Name																					
1,3-Dinitrobenzene	NA	NA	NA	NA	NA	NA	530 U	540 U	NA	NA	238 U	250 U	250 U	250 U	250 U	238 U	238 U	238 U	250 U	250 U	250 U
2,4,6-Trinitrotoluene	NA	NA	NA	NA	NA	NA	530 U	540 U	NA	NA	238 U	250 U	250 U	250 U	250 U	238 U	238 U	238 U	250 U	250 U	250 U
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	540 U	NA	NA	238 U	250 U	303	250 U	638	238 U	238 U	238 U	250 U	250 U	250 U
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	540 U	NA	NA	238 U	250 U	250 U	250 U	250 U	238 U	238 U	238 U	250 U	250 U	250 U
2-Amino-4,6-dinitrotoluene	NA	NA	NA	NA	NA	NA	530 U	540 U	NA	NA	238 U	250 U	250 U	250 U	250 U	238 U	238 U	238 U	250 U	250 U	250 U
2-Nitrotoluene	NA	NA	NA	NA	NA	NA	530 U	540 U	NA	NA	477 U	500 U	500 U	500 U	500 U	477 U	477 U	477 U	500 U	500 U	500 U
3-Nitrotoluene	NA	NA	NA	NA	NA	NA	530 U	540 U	NA	NA	477 U	500 U	500 U	500 U	500 U	477 U	477 U	477 U	500 U	500 U	500 U
4-Amino-2,6-dinitrotoluene	NA	NA	NA	NA	NA	NA	530 U	540 U	NA	NA	238 U	250 U	250 U	250 U	250 U	238 U	238 U	238 U	250 U	250 U	250 U
4-Nitrotoluene	NA	NA	NA	NA	NA	NA	530 U	540 U	NA	NA	477 U	500 U	500 U	500 U	500 U	477 U	477 U	477 U	500 U	500 U	500 U
HMX	NA	NA	NA	NA	NA	NA	530 U	540 U	NA	NA	477 U	500 U	500 U	500 U	500 U	477 U	477 U	477 U	500 U	500 U	500 U
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	540 U	NA	NA	238 U	250 U	250 U	250 U	250 U	238 U	238 U	238 U	250 U	250 U	250 U
RDX	NA	NA	NA	NA	NA	NA	530 U	540 U	NA	NA	477 U	500 U	500 U	500 U	500 U	477 U	477 U	477 U	500 U	500 U	500 U
Tetryl	NA	NA	NA	NA	NA	NA	530 U	540 U	NA	NA	477 U	500 U	500 U	500 U	500 U	477 U	477 U	477 U	500 U	500 U	500 U
Total Metals (MG/KG)																					
Aluminum	5,880	12,300	20,200	4,760	8,880	5,270	8,490	NA	5,020	10,300	5,750	12,500	8,490	8,500	10,700	1,510	5,560	3,690	12,900	4,970	13,100
Antimony	35.4 B	NA	NA	0.6 L	1.1 L	NA	0.98 L	NA	0.6 L	0.51 L	7.80 J	8.10 J	0.740 U	0.600 U	0.810 J	0.630 U	0.5 U	2.60 J	1.10 U	10.8 J	0.820 U
Arsenic	14.6 L	13.3 K	22.7 K	3.8 K	29.3 K	2 K	19.6 K	NA	2.6 K	111 K	9.10	152	17.9	7.60	17.2	0.960 J	5.30	10.6	11.2	6.30	8.80
Barium	1,040	64.7	268	120	349	35 J	397	NA	43.5	89	2,850	5,970	153	85.3	441	9.10 J	142	88.3	31.2 J	1,220	58.1 J
Beryllium	0.88	0.64 J	1.2	0.52 J	0.67 J	0.4 J	0.78 J	NA	0.38 J	0.67 J	0.410 J	0.210 J	0.460 J	0.380 J	0.460 J	0.0800 J	0.340 J	0.210 J	1.30 J	0.930 J	0.510 J
Cadmium	6	0.11 U	0.82 B	0.24 J	0.45 J	1.5	0.39 J	NA	0.25 J	0.1 U	2.70	1.20 J	0.160 J	0.0700 U	0.260 J	0.0800 J	0.0600 J	0.720 J	0.240 J	22.7	0.130 J
Calcium	8,170	570 J	671 J	2,550 J	1,780 J	7,230 J	2,620 J	NA	10,300 J	706 J	36,700	4,430	559 J	1,550	468 J	2,070	314 J	2,790	1,610 J	1,130	1,100 J
Chromium	74.6	34.8	37.1	10.6	18.7	4.6	20	NA	6.8	16.5	25.3	13.7	19.1	19.6	19.9	2.5	18.1	11.1	26.6	867	29.1
Cobalt	17.7	3.3 J	7.9 J	2.9 J	7.4 J	4.4 J	6.4 J	NA	3 J	2.5 J	3.90 J	1.90 J	2.90 J	3.60 J	2.80 J	0.390 J	1.5 J	2.70 J	11.1 J	6.10 J	3.90 J
Copper	6,470	43.6	89.2	50.2	113	17.1	114	NA	23.5	27.3	350	377	46.5	18.5	92.2	4.20 J	37.6	86.7	19.3	132	27.3
Cyanide	0.53 U	0.57 U	1.45 J	0.51 U	0.6	0.5 U	0.56 U	NA	0.49 U	0.55 U	0.239 U	0.256 U	0.380 U	0.201 U	0.320 U	0.329	0.170 U	0.300 U	0.340 U	0.240 U	0.310
Iron	120,000	32,400	31,500	9,900	14,900	12,800	15,200	NA	10,200	14,600	17,400	16,000	23,600	17,700	21,300	1,730	13,400	13,200	32,100	10,000	25,700
Lead	7,210 J	85.6	822	127	818	33.5	899	NA	37.6	83.2	2,590	275	228	69.7	817	10.4	98.7	61.5	34.3	4,740	74.4
Magnesium	3,300	1,880	3,160	2,050	1,870	2,330	1,570	NA	2,020	1,450	2,030	1,990	1,900	2,020	1,750	251 J	905 J	1,250 J	5,080	2,010	2,950
Manganese	852	63.4 K	122 K	142 K	293 K	289 K	208 K	NA	236 K	73.8 K	264	175	79.6	99.6	73.1	32.2	39.6	58.2	307	370	99.3
Mercury	0.44	0.25 L	0.42 L	0.17 L	0.98 L	NA	0.93 L	NA	0.08 L	0.21 L	0.120	0.130	0.140	0.170	0.200	0.0500	0.150	0.25	0.230	0.160	0.130
Nickel	91.5	7.9 J	19.2	7.5 B	12.9	2.6 J	13.2	NA	9.4	7.2 J	15.5	7 J	6.70 J	9.20	7.60 J	1.5 J	4.80 J	9.30 J	17	8.80	9.20 J
Potassium	963	1,630	3,800	1,220	1,870	1,440	1,480	NA	1,320	888 J	677 J	1,020 J	1,770	1,680	1,840	297 J	676 J	832 J	2,950	625 J	2,410
Selenium	0.47 UL	0.63 U	0.68 U	0.57 U	0.6 U	0.56 U	0.59 U	NA	0.54 U	0.6 U	0.550 U	0.640 J	0.780 J	0.580 U	0.920 J	0.650 J	0.490 U	0.720 U	1.10 U	0.570 U	1 J
Silver	3.5	0.26 B	0.4 B	0.21 B	0.53 B	0.54 B	0.23 B	NA	0.76 J	0.2 U	1.30 J	0.310 J	0.25 U	0.200 U	0.230 U	0.210 U	0.170 U	0.25 U	0.380 U	0.200 U	0.270 U
Sodium	764 J	150 B	575 J	94.6 B	205 B	74.2 B	132 B	NA	182 B	83.6 B	220 J	139 J	434 J	229 J	227 J	34.8 U	160 J	921 J	6,410	1,240	381 J
Thallium	5.3	2.1 J	2.9	0.64 J	0.83 J	0.37 U	1.4 J	NA	0.45 J	1.3 J	0.670 U	0.75 U	0.880 U	0.720 U	0.830 U	0.75 U	0.600 U	0.890 U	1.40 U	0.700 U	0.970 U
Vanadium	23.6	55.7	52.5	28.6	24.9	12.7	27.7	NA	12.7	37	19	19.9	29.5	39.8	33.3	6.30 J	23.4	33.2	32.4	33.8	49.3
Zinc	8,490 L	77.8	132	180	242	83.9	318	NA	126	123	969	831	79.4	76.5	95.2	20	47.6	525	93.5	1,290	91.2
pH	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Wet Chemistry (MG/KG)																					
% Solids	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	79.2	80.2	62	82.8	63	79.6	75	68.4	44.7	72.8	56.7
Phosphorus	3.9	8.4	5.6	11.8	3.2	6.5	18.8	NA	2.2	5.2	2.81 UL	2.97 UL	3.23 U	2.68 UL	4.54 U	3.06 UL	3.10 U	4.06 U	6.78 U	4.04 U	4.52 U
pH	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.91	7.42	3.75	4.97	4.21	7.71	4.14	6.77	5.16	6.69	4.20

Notes:
Shaded cells indicate detections
B - Possible blank contamination
J - Analyte present. Result may not be accurate or precise.
L - Analyte present. Reported result may be biased low.
U - Not Detected
K - Analyte present. Reported result may be biased high.
P - Duplicate sample
R - Rejected result
NA - Not analyzed

Table D-1
Surface Soil Analytical Results
Site 5 Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS05-SS21	SJS05-SS22	SJS05-SS23	SJS05-SS24	SJS05-SS25	SJS05-SS26	SJS05-SS27		SJS05-SS28	SJS05-SS30	SJS05-SS31	SJS05-SS32	SJS05-SS33	SJS05-SS34	SJS05-SS35
Sample ID	SJS05-SS21-000	SJS05-SS22-000	SJS05-SS23-000	SJS05-SS24-000	SJS05-SS25-000	SJS05-SS26-000	SJS05-SS27-000	SJS05-SS27-000P	SJS05-SS28-000	SJS05-SS30-000	SJS05-SS31-000	SJS05-SS32-000	SJS05-SS33-000	SJS05-SS34-000	SJS05-SS35-000
Sample Date	04/22/99	04/22/99	04/22/99	04/22/99	04/22/99	04/22/99	04/22/99	04/22/99	04/22/99	04/19/99	04/19/99	04/19/99	04/22/99	04/22/99	04/22/99
Chemical Name															
Volatile Organic Compounds (UG/KG)															
1,1,1-Trichloroethane	16 U	13 U	21 U	22 U	10 U	10 U	11 U	11 U	11 U	13 UJ	10 U	11 U	12 U	12 U	18 U
1,1,2,2-Tetrachloroethane	16 U	13 U	21 U	22 U	10 U	10 U	11 U	11 U	11 U	13 UJ	10 U	11 UJ	12 U	12 U	18 U
1,1,2-Trichloroethane	16 U	13 U	21 U	22 U	10 U	10 U	11 U	11 U	11 U	13 UJ	10 U	11 U	12 U	12 U	18 U
1,1-Dichloroethane	16 U	13 U	21 U	22 U	10 U	10 U	11 U	11 U	11 U	13 UJ	10 U	11 U	12 U	12 U	18 U
1,1-Dichloroethene	16 U	13 U	21 U	22 U	10 U	10 U	11 U	11 U	11 U	13 UJ	10 U	11 U	12 U	12 U	18 U
1,2-Dichloroethane	16 U	13 U	21 U	22 U	10 U	10 U	11 U	11 U	11 U	13 UJ	10 U	11 U	12 U	12 U	18 U
1,2-Dichloroethene (total)	16 U	13 U	21 U	22 U	10 U	10 U	11 U	11 U	11 U	13 UJ	10 U	11 U	12 U	12 U	18 U
1,2-Dichloropropane	16 U	13 U	21 U	22 U	10 U	10 U	11 U	11 U	11 U	13 UJ	10 U	11 U	12 U	12 U	18 U
2-Butanone	16 U	13 U	21 U	22 U	10 U	10 U	11 U	11 U	11 U	13 UJ	10 U	11 U	12 U	12 U	18 U
2-Hexanone	16 U	13 U	21 U	22 U	10 U	10 U	11 U	11 U	11 U	13 UJ	10 U	11 UJ	12 U	12 U	18 U
4-Methyl-2-pentanone	16 U	13 U	21 U	22 U	10 U	10 U	11 U	11 U	11 U	13 UJ	10 U	11 UJ	12 U	12 U	18 U
Acetone	16 U	13 U	21 U	22 U	10 U	9 J	8 J	13	11 U	55 J	29	11 U	12 U	21	18 U
Benzene	16 U	13 U	21 U	22 U	10 U	10 U	11 U	11 U	11 U	13 UJ	10 U	11 U	12 U	12 U	18 U
Bromodichloromethane	16 U	13 U	21 U	22 U	10 U	10 U	11 U	11 U	11 U	13 UJ	10 U	11 U	12 U	12 U	18 U
Bromoform	16 U	13 U	21 U	22 U	10 U	10 U	11 U	11 U	11 U	13 UJ	10 U	11 U	12 U	12 U	18 U
Bromomethane	16 U	13 U	21 U	22 U	10 U	10 U	11 U	11 U	11 U	13 UJ	10 U	11 U	12 U	12 U	18 U
Carbon disulfide	16 U	13 U	21 U	22 U	10 U	10 U	11 U	11 U	11 U	13 UJ	10 U	11 U	12 U	12 U	18 U
Carbon tetrachloride	16 U	13 U	21 U	22 U	10 U	10 U	11 U	11 U	11 U	13 UJ	10 U	11 U	12 U	12 U	18 U
Chlorobenzene	16 U	13 U	21 U	22 U	10 U	10 U	11 U	11 U	11 U	13 UJ	10 U	11 UJ	12 U	12 U	18 U
Chloroethane	16 U	13 U	21 U	22 U	10 U	10 U	11 U	11 U	11 U	13 UJ	10 U	11 U	12 U	12 U	18 U
Chloroform	16 U	13 U	21 U	22 U	10 U	2 J	11 U	11 U	11 U	13 UJ	10 U	11 U	12 U	12 U	18 U
Chloromethane	16 U	13 U	21 U	22 U	10 U	5 J	11 U	3 J	11 U	13 UJ	10 U	11 U	12 U	12 U	18 U
Dibromochloromethane	16 U	13 U	21 U	22 U	10 U	10 U	11 U	11 U	11 U	13 UJ	10 U	11 U	12 U	12 U	18 U
Ethylbenzene	16 U	13 U	21 U	22 U	10 U	10 U	11 U	11 U	11 U	13 UJ	10 U	11 UJ	12 U	12 U	18 U
Methylene chloride	19 B	32 B	25 B	29 B	94	2 J	2 J	2 J	120	24 B	23 B	9 B	100	30 B	34 B
Styrene	16 U	13 U	21 U	22 U	10 U	10 U	11 U	11 U	11 U	13 UJ	10 U	11 UJ	12 U	29	18 U
Tetrachloroethene	16 U	13 U	21 U	22 U	10 U	10 U	11 U	11 U	11 U	13 UJ	10 U	11 UJ	12 U	12 U	18 U
Toluene	16 U	13 U	21 U	22 U	10 U	10 U	11 U	4 J	11 U	13 UJ	10 U	11 UJ	12 U	12 U	18 U
Trichloroethene	16 U	13 U	21 U	22 U	5 J	21	58	45	3 J	20 B	10 J	26	4 J	5 J	8 J
Vinyl chloride	16 U	13 U	21 U	22 U	10 U	10 U	11 U	11 U	11 U	13 UJ	10 U	11 U	12 U	12 U	18 U
Xylene, total	16 U	13 U	21 U	22 U	10 U	10 U	11 U	2 J	11 U	13 UJ	10 U	11 UJ	12 U	12 U	18 U
cis-1,3-Dichloropropene	16 U	13 U	21 U	22 U	10 U	10 U	11 U	11 U	11 U	13 UJ	10 U	11 U	12 U	12 U	18 U
trans-1,3-Dichloropropene	16 U	13 U	21 U	22 U	10 U	10 U	11 U	11 U	11 U	13 UJ	10 U	11 U	12 U	12 U	18 U
Semivolatile Organic Compounds (UG/KG)															
1,2,4-Trichlorobenzene	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	610 UJ
1,2-Dichlorobenzene	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	610 UJ
1,3-Dichlorobenzene	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	610 UJ
1,4-Dichlorobenzene	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	610 UJ
2,2'-Oxybis(1-chloropropane)	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	610 UJ
2,4,5-Trichlorophenol	1,300 UJ	1,100 UJ	1,800 UJ	1,900 U	840 UJ	850 UJ	930 UJ	900 UJ	960 UJ	1,100 UJ	840 UJ	890 UJ	980 UJ	1,000 UJ	1,500 UJ
2,4,6-Trichlorophenol	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	610 UJ
2,4-Dichlorophenol	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	610 UJ
2,4-Dimethylphenol	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	610 UJ
2,4-Dinitrophenol	1,300 UJ	1,100 UJ	1,800 UJ	1,900 U	840 UJ	850 UJ	930 UJ	900 UJ	960 UJ	1,100 UJ	840 UJ	890 UJ	980 UJ	1,000 UJ	1,500 UJ
2,4-Dinitrotoluene	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	140 J	43 J	610 UJ
2,6-Dinitrotoluene	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	610 UJ
2-Chloronaphthalene	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	610 UJ
2-Chlorophenol	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	610 UJ
2-Methylnaphthalene	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	610 UJ
2-Methylphenol	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	610 UJ
2-Nitroaniline	1,300 UJ	1,100 UJ	1,800 UJ	1,900 U	840 UJ	850 UJ	930 UJ	900 UJ	960 UJ	1,100 UJ	840 UJ	890 UJ	980 UJ	1,000 UJ	1,500 UJ
2-Nitrophenol	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	610 UJ
3,3'-Dichlorobenzidine	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	610 UJ
3-Nitroaniline	1,300 UJ	1,100 UJ	1,800 UJ	1,900 U	840 UJ	850 UJ	930 UJ	900 UJ	960 UJ	1,100 UJ	840 UJ	890 UJ	980 UJ	1,000 UJ	1,500 UJ
4,6-Dinitro-2-methylphenol	1,300 UJ	1,100 UJ	1,800 UJ	1,900 U	840 UJ	850 UJ	930 UJ	900 UJ	960 UJ	1,100 UJ	840 UJ	890 UJ	980 UJ	1,000 UJ	1,500 UJ
4-Bromophenyl-phenylether	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	610 UJ
4-Chloro-3-methylphenol	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	610 UJ
4-Chloroaniline	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	610 UJ
4-Chlorophenyl-phenylether	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	610 UJ
4-Methylphenol	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	610 UJ
4-Nitroaniline	1,300 UJ	1,100 UJ	1,800 UJ	1,900 U	840 UJ	850 UJ	930 UJ	900 UJ	960 UJ	1,100 UJ	840 UJ	890 UJ	980 UJ	1,000 UJ	1,500 UJ
4-Nitrophenol	1,300 UJ	1,100 UJ	1,800 UJ	1,900 U	840 UJ	850 UJ	930 UJ	900 UJ	960 UJ	1,100 UJ	840 UJ	890 UJ	980 UJ	1,000 UJ	1,500 UJ
Acenaphthene	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	610 UJ
Acenaphthylene	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	110 J

Table D-1
Surface Soil Analytical Results
Site 5 Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS05-SS21	SJS05-SS22	SJS05-SS23	SJS05-SS24	SJS05-SS25	SJS05-SS26	SJS05-SS27		SJS05-SS28	SJS05-SS30	SJS05-SS31	SJS05-SS32	SJS05-SS33	SJS05-SS34	SJS05-SS35
Sample ID	SJS05-SS21-000	SJS05-SS22-000	SJS05-SS23-000	SJS05-SS24-000	SJS05-SS25-000	SJS05-SS26-000	SJS05-SS27-000	SJS05-SS27-000P	SJS05-SS28-000	SJS05-SS30-000	SJS05-SS31-000	SJS05-SS32-000	SJS05-SS33-000	SJS05-SS34-000	SJS05-SS35-000
Sample Date	04/22/99	04/22/99	04/22/99	04/22/99	04/22/99	04/22/99	04/22/99	04/22/99	04/22/99	04/19/99	04/19/99	04/19/99	04/22/99	04/22/99	04/22/99
Chemical Name															
Anthracene	530 UJ	430 UJ	710 UJ	740 U	340 UJ	63 J	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	140 J
Benzo(a)anthracene	130 J	430 UJ	240 J	77 J	200 J	1,000 J	370 UJ	360 UJ	90 J	220 J	340 UJ	48 J	95 J	140 J	840 J
Benzo(a)pyrene	130 J	430 UJ	140 J	740 U	230 J	1,200 J	370 UJ	360 UJ	84 J	180 J	340 UJ	50 J	110 J	130 J	760 J
Benzo(b)fluoranthene	210 J	93 J	510 J	110 J	290 J	1,600 J	370 UJ	360 UJ	190 J	490 J	77 J	110 J	170 J	250 J	2,100 J
Benzo(g,h,i)perylene	99 J	430 UJ	150 J	740 U	200 J	960 J	370 UJ	360 UJ	90 J	240 J	70 J	52 J	100 J	120 J	680 J
Benzo(k)fluoranthene	92 J	430 UJ	250 J	740 U	120 J	480 J	370 UJ	360 UJ	62 J	140 J	340 UJ	350 UJ	64 J	74 J	580 J
Butylbenzylphthalate	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	610 UJ
Carbazole	530 UJ	430 UJ	710 UJ	740 U	340 UJ	69 J	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	610 UJ
Chrysene	220 J	66 J	350 J	83 J	220 J	1,100 J	370 UJ	360 UJ	140 J	320 J	45 J	73 J	130 J	190 J	1,300 J
Di-n-butylphthalate	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	150 J	420 UJ	610 UJ
Di-n-octylphthalate	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	610 UJ
Dibenz(a,h)anthracene	530 UJ	430 UJ	710 UJ	740 U	42 J	220 J	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	260 J
Dibenzofuran	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	610 UJ
Diethylphthalate	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	610 UJ
Dimethyl phthalate	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	610 UJ
Fluoranthene	160 J	430 UJ	320 J	110 J	290 J	1,400 J	370 UJ	360 UJ	130 J	330 J	57 J	96 J	140 J	180 J	1,200 J
Fluorene	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	610 UJ
Hexachlorobenzene	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	610 UJ
Hexachlorobutadiene	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	610 UJ
Hexachlorocyclopentadiene	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	610 UJ
Hexachloroethane	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	610 UJ
Indeno(1,2,3-cd)pyrene	95 J	430 UJ	170 J	740 U	150 J	760 J	370 UJ	360 UJ	86 J	210 J	46 J	49 J	390 UJ	110 J	680 J
Isophorone	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	610 UJ
Naphthalene	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	90 J
Nitrobenzene	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	610 UJ
Pentachlorophenol	1,300 UJ	1,100 UJ	1,800 UJ	1,900 U	840 UJ	850 UJ	930 UJ	900 UJ	960 UJ	1,100 UJ	840 UJ	890 UJ	980 UJ	1,000 UJ	1,500 UJ
Phenanthrene	530 UJ	430 UJ	710 UJ	740 U	71 J	320 J	370 UJ	360 UJ	50 J	100 J	340 UJ	38 J	49 J	43 J	230 J
Phenol	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	610 UJ
Pyrene	120 J	430 UJ	240 J	76 J	260 J	1,300 J	370 UJ	360 UJ	87 J	230 J	52 J	68 J	120 J	170 J	840 J
bis(2-Chloroethoxy)methane	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	610 UJ
bis(2-Chloroethyl)ether	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	610 UJ
bis(2-Ethylhexyl)phthalate	530 UJ	66 J	710 UJ	740 U	340 UJ	340 UJ	74 J	360 UJ	380 UJ	430 UJ	37 B	350 UJ	390 UJ	420 UJ	610 UJ
n-Nitroso-di-n-propylamine	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	610 UJ
n-Nitrosodiphenylamine	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	360 UJ	380 UJ	430 UJ	340 UJ	350 UJ	390 UJ	420 UJ	610 UJ
Pesticide/Polychlorinated Biphenyls (UG/KG)															
4,4'-DDD	6.10 J	5.20 J	4.5 J	1.10 J	1.20 J	1.90 J	0.460 J	0.230 J	3.5 J	5.70 J	11 J	67 R	5.20 J	4.10 UJ	6 UJ
4,4'-DDE	40 J	150 J	7.10 J	3.40 J	5.40 J	3.30 J	2.60 J	1.20 J	31 J	250 J	15 J	1,300 J	56 J	38 J	4,700 J
4,4'-DDT	12 J	36 J	13 J	7.40 UJ	9.40 J	4.5 J	2.5 J	1.40 J	56 J	16 J	25 J	3,100 J	55 J	60 J	3,100 J
Aldrin	2.60 UJ	2.10 UJ	3.5 UJ	3.70 UJ	1.70 UJ	1.70 UJ	1.90 UJ	1.80 UJ	1.90 UJ	2.10 UJ	1.70 UJ	1.80 UJ	1.90 UJ	2.10 UJ	3 UJ
Aroclor-1016	53 UJ	43 UJ	70 UJ	74 UJ	34 UJ	34 UJ	37 UJ	36 UJ	38 UJ	43 UJ	33 UJ	35 UJ	39 UJ	41 UJ	60 UJ
Aroclor-1221	110 UJ	86 UJ	140 UJ	150 UJ	67 UJ	67 UJ	74 UJ	72 UJ	77 UJ	86 UJ	67 UJ	71 UJ	78 UJ	82 UJ	120 UJ
Aroclor-1232	53 UJ	43 UJ	70 UJ	74 UJ	34 UJ	34 UJ	37 UJ	36 UJ	38 UJ	43 UJ	33 UJ	35 UJ	39 UJ	41 UJ	60 UJ
Aroclor-1242	53 UJ	43 UJ	70 UJ	74 UJ	34 UJ	34 UJ	37 UJ	36 UJ	38 UJ	43 UJ	33 UJ	35 UJ	39 UJ	41 UJ	60 UJ
Aroclor-1248	53 UJ	43 UJ	70 UJ	74 UJ	34 UJ	34 UJ	37 UJ	36 UJ	38 UJ	43 UJ	33 UJ	35 UJ	39 UJ	41 UJ	60 UJ
Aroclor-1254	53 UJ	43 UJ	70 UJ	74 UJ	34 UJ	34 UJ	37 UJ	36 UJ	38 UJ	43 UJ	33 UJ	35 UJ	39 UJ	41 UJ	60 UJ
Aroclor-1260	53 UJ	43 UJ	70 UJ	74 UJ	34 UJ	34 UJ	37 UJ	36 UJ	38 UJ	43 UJ	33 UJ	35 UJ	39 UJ	41 UJ	60 UJ
Dieldrin	5.30 UJ	4.30 UJ	7 UJ	7.40 UJ	3.40 UJ	3.40 UJ	3.70 UJ	3.60 UJ	3.80 UJ	4.30 UJ	3.30 UJ	3.5 UJ	3.90 UJ	4.10 UJ	6 UJ
Endosulfan I	2.60 UJ	2.10 UJ	3.5 UJ	3.70 UJ	1.70 UJ	1.70 UJ	1.90 UJ	1.80 UJ	1.90 UJ	2.10 UJ	1.70 UJ	1.80 UJ	1.90 UJ	2.10 UJ	3 UJ
Endosulfan II	5.30 UJ	4.30 UJ	7 UJ	7.40 UJ	3.40 UJ	3.40 UJ	3.70 UJ	3.60 UJ	3.80 UJ	4.30 UJ	3.30 UJ	3.5 UJ	3.90 UJ	4.10 UJ	6 UJ
Endosulfan sulfate	5.30 UJ	4.30 UJ	7 UJ	7.40 UJ	3.40 UJ	3.40 UJ	3.70 UJ	3.60 UJ	3.80 UJ	4.30 UJ	3.30 UJ	3.5 UJ	3.90 UJ	4.10 UJ	6 UJ
Endrin	5.30 UJ	4.30 UJ	7 UJ	7.40 UJ	3.40 UJ	3.40 UJ	3.70 UJ	3.60 UJ	3.80 UJ	4.30 UJ	3.30 UJ	3.5 UJ	3.90 UJ	4.10 UJ	6 UJ
Endrin aldehyde	5.30 UJ	4.30 UJ	7 UJ	7.40 UJ	3.40 UJ	3.40 UJ	3.70 UJ	3.60 UJ	3.80 UJ	4.30 UJ	3.30 UJ	3.5 UJ	3.90 UJ	4.10 UJ	6 UJ
Endrin ketone	5.30 UJ	4.30 UJ	7 UJ	7.40 UJ	3.40 UJ	3.40 UJ	3.70 UJ	3.60 UJ	3.80 UJ	4.30 UJ	3.30 UJ	3.5 UJ	3.90 UJ	4.10 UJ	6 UJ
Heptachlor	2.60 UJ	2.10 UJ	3.5 UJ	3.70 UJ	1.70 UJ	1.70 UJ	1.90 UJ	1.80 UJ	1.90 UJ	2.10 UJ	1.70 UJ	1.80 UJ	1.90 UJ	2.10 UJ	3 UJ
Heptachlor epoxide	2.60 UJ	2.10 UJ	3.5 UJ	3.70 UJ	1.70 UJ	1.70 UJ	1.90 UJ	1.80 UJ	1.90 UJ	2.10 UJ	1.70 UJ	1.80 UJ	1.90 UJ	2.10 UJ	3 UJ
Methoxychlor	26 UJ	21 UJ	35 UJ	37 UJ	17 UJ	17 UJ	19 UJ	18 UJ	19 UJ	21 UJ	17 UJ	18 UJ	19 UJ	21 UJ	30 UJ
Toxaphene	260 UJ	210 UJ	350 UJ	370 UJ	170 UJ	170 UJ	190 UJ	180 UJ	190 UJ	210 UJ	170 UJ	180 UJ	190 UJ	210 UJ	300 UJ
alpha-BHC	2.60 UJ	2.10 UJ	3.5 UJ	3.70 UJ	1.70 UJ	1.70 UJ	1.90 UJ	1.80 UJ	1.90 UJ	2.10 UJ	1.70 UJ	1.80 UJ	1.90 UJ	2.10 UJ	3 UJ
alpha-Chlordane	2.60 UJ	2.10 UJ	3.5 UJ	3.70 UJ	1.70 UJ	0.580 J	1.90 UJ	1.80 UJ	1.90 UJ	2.10 UJ	1.70 UJ	1.80 UJ	1.90 UJ	2.10 UJ	3 UJ
beta-BHC	2.60 UJ	2.10 UJ	3.5 UJ	3.70 UJ	1.70 UJ	1.70 UJ	1.90 UJ	1.80 UJ	1.90 UJ	2.10 UJ	1.70 UJ	1.80 UJ	1.90 UJ	2.10 UJ	3 UJ
delta-BHC	2.60 UJ	2.10 UJ	3.5 UJ	3.70 UJ	1.70 UJ	1.70 UJ	1.90 UJ	1.80 UJ	1.90 UJ	2.10 UJ	1.70 UJ	1.80 UJ	1.90 UJ	2.10 UJ	3 UJ
gamma-BHC (Lindane)	2.60 UJ	2.10 UJ	3.5 UJ	3.70 UJ	1.70 UJ	1.70 UJ	1.90 UJ	1.80 UJ	1.90 UJ	2.10 UJ	1.70 UJ	1.80 UJ	1.90 UJ	2.10 UJ	3 UJ
gamma-Chlordane	2.60 UJ	2.10 UJ	3.5 UJ	3.70 UJ	1.70 UJ	1.70 UJ	1.90 UJ	1.80 UJ	1.90 UJ	2.10 UJ	1.70 UJ	1.80 UJ	1.90 UJ	2.10 UJ	3 UJ
Explosives (UG/KG)															
1,3,5-Trinitrobenzene	238 U	250 U	250 U	238 U	227 U	250 U	250 U	250 U	250 U	250 U	250 U	238 U	250 U	250 U	238 U

Table D-1
Surface Soil Analytical Results
Site 5 Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS05-SS21	SJS05-SS22	SJS05-SS23	SJS05-SS24	SJS05-SS25	SJS05-SS26	SJS05-SS27		SJS05-SS28	SJS05-SS30	SJS05-SS31	SJS05-SS32	SJS05-SS33	SJS05-SS34	SJS05-SS35
Sample ID	SJS05-SS21-000	SJS05-SS22-000	SJS05-SS23-000	SJS05-SS24-000	SJS05-SS25-000	SJS05-SS26-000	SJS05-SS27-000	SJS05-SS27-000P	SJS05-SS28-000	SJS05-SS30-000	SJS05-SS31-000	SJS05-SS32-000	SJS05-SS33-000	SJS05-SS34-000	SJS05-SS35-000
Sample Date	04/22/99	04/22/99	04/22/99	04/22/99	04/22/99	04/22/99	04/22/99	04/22/99	04/22/99	04/19/99	04/19/99	04/19/99	04/22/99	04/22/99	04/22/99
Chemical Name															
1,3-Dinitrobenzene	238 U	250 U	250 U	238 U	227 U	250 U	250 U	250 U	250 U	250 U	250 U	238 U	250 U	250 U	238 U
2,4,6-Trinitrotoluene	238 U	250 U	250 U	238 U	227 U	250 U	250 U	250 U	250 U	250 U	250 U	238 U	250 U	250 U	238 U
2,4-Dinitrotoluene	238 U	250 U	250 U	238 U	227 U	250 U	250 U	250 U	250 U	250 U	250 U	238 U	250 U	250 U	238 U
2,6-Dinitrotoluene	238 U	250 U	250 U	238 U	227 U	250 U	250 U	250 U	250 U	250 U	250 U	238 U	250 U	250 U	238 U
2-Amino-4,6-dinitrotoluene	238 U	250 U	250 U	417	227 U	250 U	250 U	250 U	250 U	250 U	250 U	238 U	250 U	250 U	238 U
2-Nitrotoluene	477 U	500 U	500 U	477 U	455 U	500 U	500 U	500 U	500 U	500 U	500 U	476 U	500 U	500 U	476 U
3-Nitrotoluene	477 U	500 U	500 U	477 U	455 U	500 U	500 U	500 U	500 U	500 U	500 U	476 U	500 U	500 U	476 U
4-Amino-2,6-dinitrotoluene	238 U	250 U	250 U	238 U	227 U	250 U	250 U	250 U	250 U	250 U	250 U	238 U	250 U	250 U	238 U
4-Nitrotoluene	477 U	500 U	500 U	477 U	455 U	500 U	500 U	500 U	500 U	500 U	500 U	476 U	500 U	500 U	476 U
HMX	477 U	500 U	500 U	477 U	455 U	500 U	500 U	500 U	500 U	500 U	500 U	476 U	500 U	500 U	476 U
Nitrobenzene	238 U	250 U	250 U	238 U	227 U	250 U	250 U	250 U	250 U	250 U	250 U	238 U	250 U	250 U	238 U
RDX	477 U	500 U	500 U	477 U	455 U	500 U	500 U	500 U	500 U	500 U	500 U	476 U	500 U	500 U	476 U
Tetryl	477 U	500 U	500 U	477 U	455 U	500 U	500 U	500 U	500 U	500 U	500 U	476 U	500 U	500 U	476 U
Total Metals (MG/KG)															
Aluminum	10,000	6,330	14,400	13,000	8,860	3,030	3,050	3,440	7,520	14,500	4,990	7,640	8,430	14,300	20,600
Antimony	1.90 J	1.40 J	1.80 J	1.20 U	0.460 UL	0.540 UL	0.520 UL	0.450 UL	0.580 UL	0.670 UL	0.520 UL	0.780 L	2.60 L	0.580 UL	0.840 UL
Arsenic	12.8	7.80	24.4	10.6	1.60 J	1.10 J	0.840 J	1.40 J	9.30	11.1	9.60	81.6	14.7	14.2	17.8
Barium	194	87.3	271	76.8 J	59.4	15.4 J	14.2 J	16.6 J	49.3	115	63.4	74.6	283	129	102
Beryllium	0.450 J	0.510 J	0.520 J	1.30 J	0.320 J	0.100 J	0.100 J	0.110 J	0.210 J	0.540 J	0.190 J	0.440 J	0.470 J	0.440 J	0.570 J
Cadmium	0.650 J	0.450 J	0.510 J	0.440 J	0.410 J	0.720 J	0.270 J	0.280 J	0.160 J	0.280 J	0.220 J	0.170 J	0.940 J	0.260 J	0.450 J
Calcium	5,830	3,030	792 J	8,730	1,700	672 J	352 J	375 J	1,040 J	1,830	1,230	653 J	3,540	230 J	1,170 J
Chromium	24.5	15.2	30.9	29.6	17.6	6	5.40	5.5	17.7	28	12.4	11.2	26.9	31.2	44.7
Cobalt	4.70 J	5 J	3.80 J	8.5 J	6.60 J	1 J	0.600 B	0.520 B	2 J	4.20 J	2.40 J	1.70 J	4.5 J	3.80 J	4.80 J
Copper	47	28.1	106	65.7	16	5.10	5.70	6	20.5	63.1	26.4	25.1	162	34.7	40.5
Cyanide	0.370 U	0.190 U	0.350 U	0.660	0.210 U	0.190 U	0.220 U	0.270	0.280	NA	NA	NA	0.170 U	0.25 U	0.350 U
Iron	29,500	14,000	34,200	26,500	15,200	3,180	2,810	3,030	22,100	25,700	9,850	10,400	17,300	32,300	44,400
Lead	187	105	524	117	70.2	29.7	47.1	55.5	49.3	92.3	53.4	59.1	377	250	223
Magnesium	2,500	1,520	2,400	3,160	3,540	386 J	225 J	242 J	1,560	2,640	1,610	904 J	1,570	2,540	3,780
Manganese	428	224	94.2	255	279 K	29.2 K	14.6 K	16 K	62.1 K	153	102	43.7	209 K	92.1 K	189 K
Mercury	0.350	0.150	0.370	0.430	0.0400	0.0300 J	0.0400	0.0400	0.25	0.320	0.0500	0.140	1.10	0.290	0.600
Nickel	12.2	9.10	11.6 J	20.9	12.2	2.70 J	1.90 J	2 J	5 J	13	5.90 J	6.80 J	12.6	9.20	14.2
Potassium	2,230	830	2,650	2,230	2,990	405 J	211 J	223 J	2,090	1,850	2,060	670 J	1,730	2,980	4,430
Selenium	1.10	0.490 J	1.60 J	1.10 U	0.440 U	0.520 U	0.5 U	0.440 U	0.560 U	0.920 K	0.640 K	0.520 U	0.530 U	0.550 U	0.810 U
Silver	0.190 U	0.140 U	0.370 U	0.390 U	0.150 U	0.180 U	0.170 U	0.150 U	0.190 U	0.220 U	0.170 U	0.180 U	0.180 U	0.190 U	0.280 U
Sodium	204 J	63.1 J	488 J	284 J	75.4 J	29.7 U	28.7 U	24.8 U	593 J	175 J	58.6 J	149 J	163 J	220 J	303 J
Thallium	0.660 U	0.490 U	1.30 U	1.40 U	0.540 U	0.640 U	0.620 U	0.540 U	0.690 U	0.800 U	0.620 U	0.640 U	0.650 U	0.680 U	1 U
Vanadium	44.3	29.1	62.1	51.9	34.1	8 J	8.80 J	10.1	25.8	46.3	22.7	29	31.8	42.3	69.1
Zinc	256	156	93.3	117	78.2	46.2	30.7	34.6	47.6	174	126	107	364	70.1	127
pH	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Wet Chemistry (MG/KG)															
% Solids	57.3	77.3	47.1	45.3	99	97.8	89.7	92.6	86.7	77.9	99.3	94.1	85.2	80.2	55.1
Phosphorus	5.29 U	2.44 U	6.43 U	6.31 U	3.26 UL	2.49 UL	2.72 UL	2.16 UL	3.30 UL	76.5	47.3	58.9	3.45 UL	3.67 UL	7.26 UL
pH	6.07	5.34	3.99	6.23	5.43	5.85	4.80	4.80	4.87	4.99	5.64	4.68	6.64	3.93	4.31

Notes:
Shaded cells indicate detections
B - Possible blank contamination
J - Analyte present. Result may not be accurate or preci
L - Analyte present. Reported result may be biased low.
U - Not Detected
K - Analyte present. Reported result may be biased high
P - Duplicate sample
R - Rejected result
NA - Not analyzed

Table D-2
Surface Soil Analytical Results
Site 5 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS05-SS36	SJS05-SS37		SJS05-SS38	SJS05-SS39	SJS05-SO40	SJS05-SO41	SJS05-SO42		SJS05-SO43	SJS05-SO44	SJS05-SO45	SJS05-SO46	SJS05-SO47	SJS05-SO48		SJS05-SO49
Sample ID	SJS05-SS36-000	SJS05-SS37-000	SJS05-SS37P-000	SJS05-SS38-000	SJS05-SS39-000	SJS05-SS40-00-03D	SJS05-SS41-00-03D	SJS05-SS42-00-03D	SJS05-SS42-00-03D-P	SJS05-SS43-00-03D	SJS05-SS44-00-03D	SJS05-SS45-00-03D	SJS05-SS46-00-03D	SJS05-SS47-00-03D	SJS05-SS48-00-03D-P	SJS05-SS48-00-03D	SJS05-SS49-00-03D
Sample Date	11/04/02	11/04/02	11/04/02	11/04/02	11/04/02	12/11/03	12/11/03	12/11/03	12/11/03	12/10/03	12/10/03	12/10/03	12/10/03	12/10/03	12/10/03	12/10/03	12/10/03
Chemical Name																	
Semivolatile Organic Compounds (UG/KG)																	
1,1-Biphenyl	440 U	400 U	450 U	420 U	440 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	1,100 U	1,000 U	1,100 U	1,100 U	1,100 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	440 U	400 U	450 U	420 U	440 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	440 U	400 U	450 U	420 U	440 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	440 U	400 U	450 U	420 U	440 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	1,100 U	1,000 U	1,100 U	1,100 U	1,100 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	68 J	400 U	450 U	420 U	440 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	440 U	400 U	450 U	420 U	440 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	440 U	400 U	450 U	420 U	440 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	440 U	400 U	450 U	420 U	440 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	440 U	400 U	450 U	420 U	440 U	480 U	500 U	500 U	490 U	480 U	440 U	57 J	840 U	430 U	400 U	390 U	480 U
2-Methylphenol	440 U	400 U	450 U	420 U	440 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	1,100 U	1,000 U	1,100 U	1,100 U	1,100 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	440 U	400 U	450 U	420 U	440 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	440 U	400 U	450 U	420 U	440 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	1,100 U	1,000 U	1,100 U	1,100 U	1,100 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	1,100 U	1,000 U	1,100 U	1,100 U	1,100 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	440 U	400 U	450 U	420 U	440 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	440 U	400 U	450 U	420 U	440 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	440 U	400 U	450 U	420 U	440 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	440 U	400 U	450 U	420 U	440 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	440 U	400 U	450 U	420 U	440 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	1,100 U	43 J	460 J	1,100 U	1,100 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	1,100 U	1,000 U	1,100 U	1,100 U	1,100 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	440 U	400 U	450 U	420 U	440 U	480 U	500 U	500 U	490 U	480 U	440 U	450 U	840 U	430 U	400 U	390 U	480 U
Acenaphthylene	21 J	79 J	95 J	18 J	440 U	480 U	540	52 J	490 U	480 U	440 U	150 J	120 J	71 J	400 U	390 U	130 J
Acetophenone	47 B	50 B	66 B	61 B	53 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	23 J	110 J	150 J	18 J	440 U	480 U	450 J	500 U	490 U	480 U	440 U	140 J	840 U	90 J	400 U	390 U	130 J
Atrazine	440 U	400 U	450 U	420 U	440 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	50 B	61 B	73 B	48 B	57 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	55 J	190 J	230 J	55 J	27 J	480 U	1,500	96 J	56 J	70 J	440 U	500	340 J	370 J	400 U	42 J	420 J
Benzo(a)pyrene	72 J	180 J	210 J	62 J	35 J	480 U	910	120 J	490 U	60 J	440 U	530	370 J	340 J	400 U	390 U	470 J
Benzo(b)fluoranthene	86 J	220 J	240 J	77 J	31 J	480 U	2,700	200 J	120 J	120 J	440 U	900	750 J	560	53 J	55 J	860
Benzo(g,h,i)perylene	58 J	120 J	120 J	420 U	440 U	480 U	110 J	500 U	490 U	59 J	440 U	430 J	350 J	240 J	400 U	390 U	390 J
Benzo(k)fluoranthene	89 J	220 J	260 J	72 J	38 J	480 U	820	58 J	52 J	55 J	440 U	420 J	250 J	220 J	400 U	390 U	340 J
Bis(2-chloro-1-methylethyl) ether	440 U	400 U	450 U	420 U	440 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butylbenzylphthalate	440 U	400 U	450 U	420 U	440 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Caprolactam	440 U	400 U	450 U	420 U	440 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	440 U	14 J	13 J	420 U	440 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	83 J	240 J	280 J	90 J	33 J	480 U	2,200	130 J	93 J	80 J	440 U	740	500 J	430	400 U	39 J	690
Di-n-butylphthalate	26 J	21 J	450 U	37 J	440 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octylphthalate	440 U	400 U	450 U	420 U	440 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	440 U	34 J	38 J	420 U	440 U	480 U	450 J	500 U	490 U	480 U	440 U	150 J	120 J	82 J	400 U	390 U	140 J
Dibenzofuran	440 U	400 U	450 U	420 U	440 U	480 U	500 U	500 U	490 U	480 U	440 U	450 U	840 U	430 U	400 U	390 U	480 U
Diethylphthalate	440 U	400 U	450 U	420 U	440 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	440 U	400 U	450 U	420 U	440 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	80 J	210 J	200 J	180 J	49 J	480 U	1,600	75 J	61 J	74 J	440 U	600	470 J	430	400 U	49 J	540
Fluorene	440 U	400 U	450 U	420 U	440 U	480 U	500 U	500 U	490 U	480 U	440 U	450 U	840 U	430 U	400 U	390 U	480 U
Hexachlorobenzene	440 U	400 U	450 U	420 U	440 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	440 U	400 U	450 U	420 U	440 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	440 U	400 U	450 U	420 U	440 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	440 U	400 U	450 U	420 U	440 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	71 J	160 J	150 J	52 J	28 J	480 U	840	96 J	53 J	55 J	440 U	410 J	320 J	240 J	400 U	390 U	370 J
Isophorone	440 U	400 U	450 U	420 U	440 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	440 U	400 U	12 J	420 U	440 U	480 U	500 U	500 U	490 U	480 U	440 U	77 J	840 U	52 J	400 U	390 U	67 J
Nitrobenzene	440 U	400 U	450 U	420 U	440 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	1,100 U	1,000 U	1,100 U	1,100 U	1,100 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	31 J	45 J	36 J	49 J	25 J	480 U	390 J	500 U	490 U	480 U	440 U	230 J	170 J	220 J	400 U	390 U	210 J
Phenol	440 U	400 U	450 U	420 U	440 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	61 J	240 J	230 J	150 J	47 J	63 J	1,100	85 J	57 J	65 J	440 U	430 J	360 J	330 J	400 U	49 J	400 J
bis(2-Chloroethoxy)methane	440 U	400 U	450 U	420 U	440 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl)ether	440 U	400 U	450 U	420 U	440 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	37 B	31 B	55 B	44 B	47 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitroso-di-n-propylamine	440 U	400 U	450 U	420 U	440 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	440 U	400 U	450 U	420 U	440 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pesticide/Polychlorinated Biphenyls (UG/KG)																	
4,4'-DDD	NA	NA	NA	NA	NA	7.3	4.3 J	5 U	4.9 U	6.8	4.9 J	11	23	25	4.1 U	3.9 U	9.7
4,4'-DDE	NA	NA	NA	NA	NA	19	8.9 J	17	18	4.9	370	190	59	820	30	30	270
4,4'-DDT	NA	NA	NA	NA	NA	10	10 J	11	9.3 J	36	170	26	24	130 J	6.6	6.7	180
Aldrin	NA	NA	NA	NA	NA	2.4 U	2.5 U	2.6 U	2.5 U	2.4 U	2.3 U	2.3 U	4.2 U	4.3 U	2.1 U	2 U	2.5 U

Table D-2
Surface Soil Analytical Results
Site 5 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS05-SO50		SJS05-SO51	SJS05-SO52	SJS05-SO53	SJS05-SO54	SJS05-SO55	SJS05-SO56	SJS05-SO57	SJS05-SO58	SJS05-SO59	SJS05-SO60	SJS05-SO61	SJS05-SO62	SJS05-SO63	SJS05-SO64
Sample ID	SJS05-SS50-00-03D-P	SJS05-SS50-00-03D	SJS05-SS51-00-03D	SJS05-SS52-00-03D	SJS05-SS53-00-03D	SJS05-SS54-00-03D	SJS05-SS55-00-03D	SJS05-SS56-00-03D	SJS05-SS57-00-03D	SJS05-SS58-00-03D	SJS05-SS59-00-03D	SJS05-SS60-00-03D	SJS05-SS61-00-03D	SJS05-SS62-00-03D	SJS05-SS63-00-03D	SJS05-SS64-00-03D
Sample Date	12/10/03	12/10/03	12/10/03	12/10/03	12/10/03	12/10/03	12/10/03	12/11/03	12/11/03	12/11/03	12/11/03	12/11/03	12/11/03	12/10/03	12/10/03	12/10/03
Chemical Name																
Semivolatile Organic Compounds (UG/KG)																
1,1-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	500 U	500 U	370 U	410 U	410 U	400 U	410 U	510 U	480 U	450 U	570 U	500 U	440 U	370 U	420 U	380 U
2-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	500 U	500 U	370 U	410 U	410 U	400 U	410 U	510 U	480 U	450 U	570 U	500 U	440 U	370 U	420 U	380 U
Acenaphthylene	150 J	140 J	370 U	410 U	49 J	400 U	410 U	150 J	380 J	450 U	570 U	500 U	440 U	370 U	420 U	380 U
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	120 J	120 J	370 U	410 U	180 J	400 U	410 U	150 J	290 J	450 U	570 U	500 U	440 U	370 U	420 U	380 U
Atrazine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	400 J	410 J	120 J	410 U	810	290 J	100 J	230 J	1,100	450 U	72 J	500 U	440 U	370 U	130 J	98 J
Benzo(a)pyrene	410 J	410 J	130 J	44 J	840	290 J	110 J	130 J	560	53 J	570 U	500 U	440 U	370 U	130 J	97 J
Benzo(b)fluoranthene	840	810	190 J	67 J	1,600	400 J	160 J	560	1,900	450 U	93 J	500 U	73 J	370 U	240 J	170 J
Benzo(g,h,i)perylene	370 J	380 J	93 J	410 U	330 J	210 J	80 J	510 U	70 J	450 U	570 U	500 U	440 U	370 U	110 J	79 J
Benzo(k)fluoranthene	280 J	330 J	66 J	27 J	660	150 J	63 J	170 J	560	450 U	570 U	500 U	440 U	370 U	84 J	55 J
Bis(2-chloro-1-methylethyl) ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butylbenzylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Caprolactam	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	610	610	140 J	410 U	1,000	300 J	110 J	340 J	1,500	450 U	75 J	500 U	54 J	370 U	180 J	130 J
Di-n-butylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	140 J	140 J	370 U	410 U	410 U	60 J	410 U	87 J	260 J	450 U	570 U	500 U	440 U	370 U	420 U	380 U
Dibenzofuran	500 U	500 U	370 U	410 U	410 U	400 U	410 U	510 U	480 U	450 U	570 U	500 U	440 U	370 U	420 U	380 U
Diethylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	610	600	220 J	410 U	750	390 J	100 J	290 J	1,300	450 U	120 J	500 U	49 J	370 U	210 J	180 J
Fluorene	500 U	500 U	370 U	410 U	410 U	400 U	410 U	510 U	480 U	450 U	570 U	500 U	440 U	370 U	420 U	380 U
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	360 J	380 J	77 J	410 U	340 J	180 J	72 J	170 J	550	450 U	570 U	500 U	440 U	370 U	110 J	67 J
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	500 U	500 U	370 U	410 U	410 U	400 U	410 U	510 U	480 U	450 U	570 U	500 U	440 U	370 U	420 U	380 U
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	220 J	250 J	110 J	410 U	190 J	110 J	410 U	67 J	280 J	450 U	77 J	500 U	440 U	370 U	72 J	380 U
Phenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	410 J	440 J	180 J	410 U	990	360 J	110 J	230 J	720	47 J	110 J	500 U	53 J	370 U	160 J	170 J
bis(2-Chloroethoxy)methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl)ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pesticide/Polychlorinated Biphenyls (UG/KG)																
4,4'-DDD	23	21	18	14.1	4.2	4.7 J	1.7 J	51 U	4.7 U	4.5 U	57 U	5 U	8.7 J	18	16	2.4 J
4,4'-DDE	370	360	160	51.1	30	110	19	380	110	7.2 J	1,300	170	220	470	110	52
4,4'-DDT	160	110	16	39.2	5.9 J	17	12	1,400	140	4.2 J	350	44 J	52 J	220	87	15
Aldrin	2.5 U	2.5 U	1.9 U	2.1 U	2.1 U	2.1 U	2.1 U	26 U	2.4 U	2.3 U	29 U	2.6 U	2.2 U	1.9 U	2.1 U	1.9 U

Table D-2
Surface Soil Analytical Results
Site 5 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS05-SO65	SJS05-SO66	SJS05-SO67
Sample ID	SJS05-SS65-00-03D	SJS05-SS66-00-03D	SJS05-SS67-00-03D
Sample Date	12/10/03	12/10/03	12/10/03
Chemical Name			
Semivolatile Organic Compounds (UG/KG)			
1,1-Biphenyl	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA
2,4-Dinitrotoluene	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA
2-Chlorophenol	NA	NA	NA
2-Methylnaphthalene	400 U	1,300 U	420 U
2-Methylphenol	NA	NA	NA
2-Nitroaniline	NA	NA	NA
2-Nitrophenol	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA
3-Nitroaniline	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA
4-Bromophenyl-phenylether	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA
4-Chloroaniline	NA	NA	NA
4-Chlorophenyl-phenylether	NA	NA	NA
4-Methylphenol	NA	NA	NA
4-Nitroaniline	NA	NA	NA
4-Nitrophenol	NA	NA	NA
Acenaphthene	400 U	1,300 U	420 U
Acenaphthylene	400 U	1,300 U	420 U
Acetophenone	NA	NA	NA
Anthracene	400 U	1,300 U	420 U
Atrazine	NA	NA	NA
Benzaldehyde	NA	NA	NA
Benzo(a)anthracene	140 J	230 J	78 J
Benzo(a)pyrene	130 J	640 J	71 J
Benzo(b)fluoranthene	200 J	2,300	190 J
Benzo(g,h,i)perylene	110 J	2,300	65 J
Benzo(k)fluoranthene	80 J	540 J	66 J
Bis(2-chloro-1-methylethyl) ether	NA	NA	NA
Butylbenzylphthalate	NA	NA	NA
Caprolactam	NA	NA	NA
Carbazole	NA	NA	NA
Chrysene	160 J	410 J	130 J
Di-n-butylphthalate	NA	NA	NA
Di-n-octylphthalate	NA	NA	NA
Dibenz(a,h)anthracene	400 U	560 J	420 U
Dibenzofuran	400 U	1,300 U	420 U
Diethylphthalate	NA	NA	NA
Dimethyl phthalate	NA	NA	NA
Fluoranthene	220 J	350 J	120 J
Fluorene	400 U	1,300 U	420 U
Hexachlorobenzene	NA	NA	NA
Hexachlorobutadiene	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA
Hexachloroethane	NA	NA	NA
Indeno(1,2,3-cd)pyrene	88 J	1,600	66 J
Isophorone	NA	NA	NA
Naphthalene	400 U	1,300 U	420 U
Nitrobenzene	NA	NA	NA
Pentachlorophenol	NA	NA	NA
Phenanthrene	110 J	140 J	72 J
Phenol	NA	NA	NA
Pyrene	210 J	1,300 U	100 J
bis(2-Chloroethoxy)methane	NA	NA	NA
bis(2-Chloroethyl)ether	NA	NA	NA
bis(2-Ethylhexyl)phthalate	NA	NA	NA
n-Nitroso-di-n-propylamine	NA	NA	NA
n-Nitrosodiphenylamine	NA	NA	NA
Pesticide/Polychlorinated Biphenyls (UG/KG)			
4,4'-DDD	13	33	17
4,4'-DDE	72	170	200
4,4'-DDT	13	53	200
Aldrin	2.1 U	3.4 U	2.1 U

Table D-2
Surface Soil Analytical Results
Site 5 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS05-SS36	SJS05-SS37		SJS05-SS38	SJS05-SS39	SJS05-SO40	SJS05-SO41	SJS05-SO42		SJS05-SO43	SJS05-SO44	SJS05-SO45	SJS05-SO46	SJS05-SO47	SJS05-SO48		SJS05-SO49
Sample ID	SJS05-SS36-000	SJS05-SS37-000	SJS05-SS37P-000	SJS05-SS38-000	SJS05-SS39-000	SJS05-SS40-00-03D	SJS05-SS41-00-03D	SJS05-SS42-00-03D	SJS05-SS42-00-03D-P	SJS05-SS43-00-03D	SJS05-SS44-00-03D	SJS05-SS45-00-03D	SJS05-SS46-00-03D	SJS05-SS47-00-03D	SJS05-SS48-00-03D-P	SJS05-SS48-00-03D	SJS05-SS49-00-03D
Sample Date	11/04/02	11/04/02	11/04/02	11/04/02	11/04/02	12/11/03	12/11/03	12/11/03	12/11/03	12/10/03	12/10/03	12/10/03	12/10/03	12/10/03	12/10/03	12/10/03	12/10/03
Chemical Name																	
Dieldrin	NA	NA	NA	NA	NA	4.7 U	4.9 U	5 U	4.9 U	4.8 U	4.4 U	4.4 U	8.2 U	8.4 U	4.1 U	3.9 U	4.8 U
Endosulfan I	NA	NA	NA	NA	NA	2.4 U	2.5 U	2.6 U	2.5 U	2.4 U	2.3 U	2.3 U	4.2 U	4.3 U	2.1 U	2 U	2.5 U
Endosulfan II	NA	NA	NA	NA	NA	4.7 U	4.9 U	5 U	4.9 U	4.8 U	4.4 U	4.4 U	8.2 U	8.4 U	4.1 U	3.9 U	4.8 U
Endosulfan sulfate	NA	NA	NA	NA	NA	4.7 U	4.9 U	5 U	4.9 U	4.8 U	4.4 U	4.4 U	8.2 U	8.4 U	4.1 U	3.9 U	5.4 J
Endrin	NA	NA	NA	NA	NA	4.7 U	4.9 U	5 U	4.9 U	4.8 U	4.4 U	4.4 U	8.2 U	8.4 U	4.1 U	3.9 U	4.8 U
Endrin aldehyde	NA	NA	NA	NA	NA	4.7 U	4.9 U	5 U	4.9 U	4.8 U	4.4 U	4.4 U	8.2 U	8.4 U	4.1 U	3.9 U	4.8 U
Endrin ketone	NA	NA	NA	NA	NA	4.7 U	4.9 U	5 U	4.9 U	4.8 U	4.4 U	4.4 U	8.2 U	8.4 U	4.1 U	3.9 U	5.6 J
Heptachlor	NA	NA	NA	NA	NA	2.4 U	2.5 U	2.6 U	2.5 U	2.4 U	2.3 U	2.3 U	4.2 U	4.3 U	2.1 U	2 U	2.5 U
Heptachlor epoxide	NA	NA	NA	NA	NA	2.4 U	2.5 U	2.6 U	2.5 U	2.4 U	2.3 U	2.3 U	4.2 U	4.3 U	2.1 U	2 U	2.5 U
Methoxychlor	NA	NA	NA	NA	NA	24 U	25 U	26 U	25 U	24 U	23 U	23 U	42 U	43 U	21 U	20 U	25 U
Toxaphene	NA	NA	NA	NA	NA	240 U	250 U	260 U	250 U	240 U	230 U	230 U	420 U	430 U	210 U	200 U	250 U
alpha-BHC	NA	NA	NA	NA	NA	2.4 U	2.5 U	2.6 U	2.5 U	2.4 U	2.3 U	2.3 U	4.2 U	4.3 U	2.1 U	2 U	2.5 U
alpha-Chlordane	NA	NA	NA	NA	NA	2.4 U	2.5 U	2.6 U	2.5 U	2.4 U	2.3 U	2.3 U	4.2 U	4.3 U	21 U	2 U	2.5 U
beta-BHC	NA	NA	NA	NA	NA	2.4 U	2.5 U	2.6 U	2.5 U	2.4 U	2.3 U	2.3 U	4.2 U	4.3 U	2.1 U	2 U	2.5 U
delta-BHC	NA	NA	NA	NA	NA	2.4 U	2.5 U	2.6 U	2.5 U	2.4 U	2.3 U	2.3 U	4.2 U	4.3 U	2.1 U	2 U	2.5 U
gamma-BHC (Lindane)	NA	NA	NA	NA	NA	2.4 U	2.5 U	2.6 U	2.5 U	2.4 U	2.3 U	2.3 U	4.2 U	4.3 U	2.1 U	2 U	2.5 U
gamma-Chlordane	NA	NA	NA	NA	NA	2.4 U	2.5 U	2.6 U	2.5 U	2.4 U	2.3 U	2.3 U	4.2 U	4.3 U	2.1 U	2 U	2.5 U
Dioxin/Furans (UG/KG)																	
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.056	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-Heptachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.084	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8,9-Heptachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0077	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0036 J	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-Hexachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.035	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0057 J	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-Hexachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.013	NA	NA	NA	NA	NA	NA
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0087	NA	NA	NA	NA	NA	NA
1,2,3,7,8,9-Hexachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	9.00E-04 J	NA	NA	NA	NA	NA	NA
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0035 J	NA	NA	NA	NA	NA	NA
1,2,3,7,8-Pentachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0073	NA	NA	NA	NA	NA	NA
2,3,4,6,7,8-Hexachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.019	NA	NA	NA	NA	NA	NA
2,3,4,7,8-Pentachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.011	NA	NA	NA	NA	NA	NA
2,3,7,8-TCDD (dioxin)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.40E-04 B	NA	NA	NA	NA	NA	NA
2,3,7,8-Tetrachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0067 J	NA	NA	NA	NA	NA	NA
Octachlorodibenzo-p-dioxin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.38	NA	NA	NA	NA	NA	NA
Octachlorodibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.1	NA	NA	NA	NA	NA	NA
Total Metals (MG/KG)																	
Aluminum	9,930	1,920	2,090	4,920	3,190	900	7,710	7,510	8,410	7,170	2,700	9,780	17,900	7,640	9,870	8,630	22,200
Antimony	9.7 J	9.1 J	11.4 J	28 J	0.39 B	0.53 L	0.56 UL	0.57 UL	0.5 UL	0.55 R	56.5 L	0.67 L	44.7 L	0.47 R	1.7 L	0.54 L	0.52 R
Arsenic	29.1	18.8	16.9	37.7 J	1.8 J	1.7 J	7	9.5	9.4	24.1	40	7.4	136	10.6	10.4	8.3	18
Barium	23,900	554	579	642	104	96.2	37.4 J	39.3 J	46.6 J	171	1,380	282	16,500	104	717	466	112
Beryllium	0.42 J	0.1 J	0.13 J	0.27 J	0.14 J	0.086 J	0.15 J	0.39 J	0.45 J	0.2 J	0.092 J	0.21 J	0.14 J	0.22 J	0.36 J	0.36 J	0.39 J
Cadmium	7.5	1.2 J	1.1 J	47.8 J	0.67 J	0.053 U	0.056 U	0.057 U	0.05 U	0.73 J	11.1	0.046 U	9.2	0.047 U	4.1	3.1	0.052 U
Calcium	9,080	1,630	1,600	4,420 J	1,710	331 J	419 J	1,010 J	1,100 J	3,550 J	5,660 J	1,490 J	3,810 J	540 J	8,530 J	9,170 J	3,390 J
Chromium	81.3	29.8	32.7	37.3 J	8.7	15.1	15.5	11.8	13.8	15	45.4	19.7	51	17.4	26.4	27.3	41
Cobalt	5.7 J	1.8 J	2 J	3.4 J	0.78 B	1.3 J	1.3 J	6.7 J	10.2 J	5.1 J	5.6 J	2.7 J	0.78 J	2.1 J	3.8 J	4 J	5.3 J
Copper	690	906 J	370 J	192	14.4	14.8 J	22 J	13.6 J	14.8 J	63.3 J	209,000 J	30.7 J	555 J	32.4 J	92.4 J	88 J	60.3 J
Cyanide	NA	NA	NA	NA	NA	0.18 U	0.21 U	0.19 U	0.19 U	3 U	0.58 J	0.18 U	0.33 U	0.18 U	0.18 U	0.21 J	0.25 J
Iron	13,800	7,780	8,170	66,800 J	4,040	9,340	16,200	25,800	20,300	16,500	45,300	17,700	26,800	18,600	15,000	13,700	40,300
Lead	2,210	480	516	442	45.6	832	36.2	27.6	36.9	67.1	683	98.4	1,000	520	259	214	557
Magnesium	9,820	554 J	601 J	1,240 J	537 J	237 J	1,340 J	1,910	2,120	1,610	5,970	1,870	2,600	1,550	1,790	1,810	4,430
Manganese	1,870	99.4	110	393 J	40.5	49.7 K	37.9 K	379 K	558 K	132	723	64.7	297	72.7	255	236	145
Mercury	0.12 J	0.089 J	0.12 J	0.11 J	0.067 U	0.062 U	0.23	0.11 J	0.14 J	0.37	0.082 J	0.33	0.44	0.22	0.074 J	0.09 J	0.69
Nickel	11.2	7 J	6.9 J	10.9	3.5 J	3.1 J	3.9 J	8.7 J	14	14.5	198	7.2 J	18 J	6.1 J	8.7 J	8.4 J	14.2
Potassium	1,120 J	303 J	332 J	899 J	413 J	195 B	1,600	2,160	1,930	1,080 J	269 B	1,350	2,070 J	1,460	1,160 J	1,150	3,180
Selenium	1.5	0.71 U	0.82 U	2.1 J	0.77 U	0.79 U	0.84 U	0.85 U	0.75 U	0.83 UL	6.1 L	0.69 UL	1.4 UL	0.7 UL	0.72 UL	0.66 UL	0.77 UL
Silver	0.34 J	0.19 U	0.22 U	0.2 U	0.21 U	1.3 J	2.3 J	3.5	2.7	2.5 J	19.8	2.7	4.4 J	2.9	2.4	2.2 J	6.1
Sodium	79.2 U	71.8 U	82.8 U	77.6 U	78.3 U	55.7 B	320 J	1,710	1,450	548 J	51.7 B	95.4 B	133 B	97.7 B	111 B	120 B	262 J
Thallium	0.62 U	0.57 U	0.65 U	3.3 J	0.62 U	0.53 U	0.6 J	0.57 U	0.5 U	0.55 U	7.7	0.46 U	0.92 U	0.47 U	0.48 U	0.52 J	0.52 U
Vanadium	22.8	12.4	12.7 J	28.3	12.9	5 J	21.2	18.6	26.4	23.7	6.5 J	26	67.2	26.1	19.7	19	55.9
Zinc	3,850	2,830	1,550	1,010	66.5	114 J	30.2 J	78.2 J	93.7 J	2,100	124,000	70.7	2,160	61.2	469	345	121

Notes:
Shaded cells indicate detections
B - Possible blank contamination
J - Analyte present. Result may not be accurate or precise.
L - Analyte present. Reported result may be biased low.
U - Not Detected
K - Analyte present. Reported result may be biased high.
P - Duplicate sample
NA - Not analyzed

Table D-2
Surface Soil Analytical Results
Site 5 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS05-SO50		SJS05-SO51	SJS05-SO52	SJS05-SO53	SJS05-SO54	SJS05-SO55	SJS05-SO56	SJS05-SO57	SJS05-SO58	SJS05-SO59	SJS05-SO60	SJS05-SO61	SJS05-SO62	SJS05-SO63	SJS05-SO64
Sample ID	SJS05-SS50-00-03D-P	SJS05-SS50-00-03D	SJS05-SS51-00-03D	SJS05-SS52-00-03D	SJS05-SS53-00-03D	SJS05-SS54-00-03D	SJS05-SS55-00-03D	SJS05-SS56-00-03D	SJS05-SS57-00-03D	SJS05-SS58-00-03D	SJS05-SS59-00-03D	SJS05-SS60-00-03D	SJS05-SS61-00-03D	SJS05-SS62-00-03D	SJS05-SS63-00-03D	SJS05-SS64-00-03D
Sample Date	12/10/03	12/10/03	12/10/03	12/10/03	12/10/03	12/10/03	12/10/03	12/11/03	12/11/03	12/11/03	12/11/03	12/11/03	12/11/03	12/10/03	12/10/03	12/10/03
Chemical Name																
Dieldrin	4.9 U	4.9 U	3.7 U	4 U	4.1 U	4 U	4.1 U	51 U	4.7 U	4.5 U	57 U	5 U	4.3 U	3.7 U	4.1 U	3.8 U
Endosulfan I	2.5 U	2.5 U	1.9 U	2.1 U	2.1 U	2.1 U	2.1 U	26 U	2.4 U	2.3 U	29 U	2.6 U	2.2 U	1.9 U	2.1 U	1.9 U
Endosulfan II	4.9 U	4.9 U	3.7 U	4 U	4.1 U	4 U	4.1 U	51 U	4.7 U	4.5 U	57 U	5 U	4.3 U	3.7 U	4.1 U	3.8 U
Endosulfan sulfate	6.2 J	4.9 U	3.7 U	4 U	11 J	4 U	4.1 U	51 U	4.7 U	4.5 U	57 U	5 U	4.3 U	3.7 U	4.1 U	3.8 U
Endrin	4.9 U	4.9 U	3.7 U	4 U	4.1 U	4 U	4.1 U	51 U	4.7 U	4.5 U	57 U	5 U	4.3 U	3.7 U	4.1 U	3.8 U
Endrin aldehyde	4.9 U	4.9 U	3.7 U	4 U	4.1 U	4 U	4.1 U	51 U	4.7 U	4.5 U	57 U	5 U	4.3 U	3.7 U	4.1 U	3.8 U
Endrin ketone	11	9.2	3.7 U	4 U	20	4 U	4.1 U	51 U	4.7 U	4.5 U	57 U	5 U	4.3 U	3.7 U	4.1 U	3.8 U
Heptachlor	2.5 U	2.5 U	1.9 U	2.1 U	2.1 U	2.1 U	2.1 U	26 U	2.4 U	2.3 U	29 U	2.6 U	2.2 U	1.9 U	2.1 U	1.9 U
Heptachlor epoxide	2.5 U	2.5 U	1.9 U	2.1 U	2.1 U	2.1 U	2.1 U	26 U	2.4 U	2.3 U	29 U	2.6 U	2.2 U	1.9 U	2.1 U	1.9 U
Methoxychlor	25 U	25 U	19 U	21 U	21 U	21 U	21 U	260 U	24 U	23 U	290 U	26 U	22 U	19 U	21 U	19 U
Toxaphene	250 U	250 U	190 U	210 U	210 U	210 U	210 U	2,600 U	240 U	230 U	2,900 U	260 U	220 U	190 U	210 U	190 U
alpha-BHC	2.5 U	2.5 U	1.9 U	2.1 U	2.1 U	2.1 U	2.1 U	26 U	2.4 U	2.3 U	29 U	2.6 U	2.2 U	1.9 U	2.1 U	1.9 U
alpha-Chlordane	2.5 U	2.5 U	1.9 U	2.1 U	2.1 U	2.1 U	2.1 U	26 U	2.4 U	2.3 U	29 U	2.6 U	2.2 U	1.9 U	2.1 U	1.9 U
beta-BHC	2.5 U	2.5 U	1.9 U	2.1 U	2.1 U	2.1 U	2.1 U	26 U	2.4 U	2.3 U	29 U	2.6 U	2.2 U	1.9 U	2.1 U	1.9 U
delta-BHC	2.5 U	2.5 U	1.9 U	2.1 U	2.1 U	2.1 U	2.1 U	26 U	2.4 U	2.3 U	29 U	2.6 U	2.2 U	1.9 U	2.1 U	1.9 U
gamma-BHC (Lindane)	2.5 U	2.5 U	1.9 U	2.1 U	2.1 U	2.1 U	2.1 U	26 U	2.4 U	2.3 U	29 U	2.6 U	2.2 U	1.9 U	2.1 U	1.9 U
gamma-Chlordane	2.5 U	2.5 U	1.9 U	2.1 U	2.1 U	2.1 U	2.1 U	26 U	2.4 U	2.3 U	29 U	2.6 U	2.2 U	1.9 U	2.1 U	1.9 U
Dioxin/Furans (UG/KG)																
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	0.18	0.061	NA	NA	0.09	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-Heptachlorodibenzofuran	0.023	0.0099	NA	NA	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8,9-Heptachlorodibenzofuran	0.0018 J	5.80E-04 B	NA	NA	1.00E-03 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	0.0059 J	0.0021 J	NA	NA	0.0016 Q	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-Hexachlorodibenzofuran	0.0046 J	0.0029 J	NA	NA	0.0031 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	0.0091	0.0036 J	NA	NA	0.0036 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-Hexachlorodibenzofuran	0.0056 J	0.0023 J	NA	NA	0.0016 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	0.017	0.0069 J	NA	NA	0.0053 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8,9-Hexachlorodibenzofuran	3.70E-04 B	2.40E-04 B	NA	NA	2.40E-04 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	0.0044 J	0.0017 J	NA	NA	0.0013 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8-Pentachlorodibenzofuran	0.0041 J	0.0017 J	NA	NA	0.0016 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6,7,8-Hexachlorodibenzofuran	0.0043 J	0.0021 J	NA	NA	0.0014 Q	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,7,8-Pentachlorodibenzofuran	0.0042 J	0.0024 J	NA	NA	0.002 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,7,8-TCDD (dioxin)	9.10E-04 B	6.40E-04 B	NA	NA	0.0013 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,7,8-Tetrachlorodibenzofuran	0.0043 J	0.0021 J	NA	NA	0.0017 Q	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Octachlorodibenzo-p-dioxin	2.4	0.76	NA	NA	0.86	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Octachlorodibenzofuran	0.047	0.015	NA	NA	0.011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Metals (MG/KG)																
Aluminum	19,400	16,700	2,230	5,600	8,820	4,330	1,740	21,300	9,770	8,070	8,580	7,690	4,900	4,940	18,700	3,680
Antimony	0.58 R	0.48 R	0.42 R	0.46 R	0.44 R	0.47 UL	0.4 UL	0.62 UL	0.49 UL	0.53 UL	0.6 UL	0.75 L	0.45 UL	0.41 R	0.46 R	0.42 R
Arsenic	11	10.3	0.88 J	2.2 J	4.4	2.2 J	0.88 J	14.7	12.8	2.8	3.7	4.9	6.8	8.6	4	2.3
Barium	121	118	33.9 J	3,350	234	31.4 J	19.7 J	148	67.1	28.3 J	50.9 J	45.8 J	41.6 J	70.7	82.4	32.3 J
Beryllium	0.43 J	0.48 J	0.086 J	1 J	0.33 J	0.3 J	0.098 J	0.38 J	0.16 J	0.18 J	0.25 J	0.22 J	0.35 J	0.11 J	0.4 J	0.061 J
Cadmium	0.058 U	0.048 U	0.16 J	3.2	0.3 J	0.047 U	0.04 U	0.062 U	0.049 U	0.053 U	0.06 U	0.05 U	0.06 J	0.41 J	0.1 J	0.45 J
Calcium	2,350 J	2,280 J	165,000 J	2,110 J	28,100 J	36,600	458 J	1,220 J	358 J	327 J	479 J	353 J	63,300	1,330 J	1,060 J	1,430 J
Chromium	35.3	30.7	2.6	28	17.5	12.2	5.2	39.5	19.6	8.6	10.5	9.9	9.1	3.7	18.3	4
Cobalt	4.7 J	4 J	1.2 J	7.7 J	3.1 J	2.7 J	0.92 J	5.2 J	1.9 J	0.84 J	1.4 J	1.5 J	1.8 J	2.2 J	2.8 J	1.7 J
Copper	76.8 J	148 J	8.6 J	138 J	22.5 J	11 J	8.1 J	43.4 J	19.4 J	9.9 J	16.6 J	11.9 J	14.8 J	12.5 J	28.6 J	18.1 J
Cyanide	0.21 U	0.21 J	5.2	0.54 J	0.18 U	0.18 U	0.16 U	0.24 J	0.21 U	0.19 U	0.33 J	0.21 J	0.2 U	0.36 J	0.17 U	0.14 U
Iron	31,300	29,000	3,690	12,000	13,600	6,810	2,700	34,300	27,200	5,780	7,420	6,090	7,810	8,220	13,400	8,340
Lead	157	135	17.5	502	80.7	58.1	41.4	135	56.2	37.9	109	57.3	53.4	27.4	43.3	69.8
Magnesium	3,600	3,000	965 J	1,380	1,740	842 J	299 J	4,420	2,070	477 J	592 J	578 J	1,090 J	1,750	1,230	1,250
Manganese	121	107	265	105	147	138 K	31.6 K	349 K	63.2 K	16.7 K	50.4 K	46.8 K	160 K	163	50.5	146
Mercury	0.52	0.37	0.064 J	0.062 U	0.13	0.061 U	0.06 U	0.36	0.36	0.066 J	0.16 J	0.076 U	0.14	0.14	0.19	0.055 U
Nickel	13.7	10.9	1.9 J	71.1	7.8 J	4.9 J	2.2 J	12.7	6.2 J	4.8 J	7.2 J	5.5 J	3.8 J	1.8 J	9.5	2.4 J
Potassium	2,620	2,280	413 J	521 J	1,290	504 J	226 B	3,690	2,980	276 B	492 B	403 B	598 J	1,320	661 J	891 J
Selenium	0.87 UL	0.72 UL	0.63 UL	0.69 UL	0.66 UL	0.71 U	0.6 U	0.92 U	0.74 U	0.8 U	0.91 U	0.75 U	0.67 U	0.62 UL	0.7 UL	0.63 UL
Silver	4.7	4.3	1 J	2 J	2.2	1 J	0.34 J	4.7	3.8	0.85 J	1 J	0.84 J	1.2 J	1.3 J	2.1 J	1.3 J
Sodium	194 B	137 B	841 J	173 B	180 B	260 J	24.7 B	949 J	1,200 J	318 J	312 J	234 J	558 J	53.6 B	67.5 B	54 B
Thallium	0.58 U	0.48 U	1.5 J	0.52 J	0.57 J	1.3 J	0.4 U	0.62 U	0.49 U	0.53 U	0.6 U	0.51 J	0.94 J	0.41 U	0.46 U	0.42 U
Vanadium	53.9	48.6	8.3 J	35.2	31	16.1	14	60.3	35.8	24	37	32.7	16.5	12	28.3	8.4 J
Zinc	114	104	44.6	1,870	92.7	41.6 J	28 J	122 J	53.2 J	27 J	72.4 J	61.3 J	69.7 J	115	208	89.9

Notes:
Shaded cells indicate detections
B - Possible blank contamination
J - Analyte present. Result may not be accurate or preci
L - Analyte present. Reported result may be biased low.
U - Not Detected
K - Analyte present. Reported result may be biased high
P - Duplicate sample
NA - Not analyzed

Table D-2
Surface Soil Analytical Results
Site 5 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS05-SO65	SJS05-SO66	SJS05-SO67
Sample ID	SJS05-SS65-00-03D	SJS05-SS66-00-03D	SJS05-SS67-00-03D
Sample Date	12/10/03	12/10/03	12/10/03
Chemical Name			
Dieldrin	4.1 U	6.6 U	4.1 U
Endosulfan I	2.1 U	3.4 U	2.1 U
Endosulfan II	4.1 U	6.6 U	4.1 U
Endosulfan sulfate	4.1 U	9.3 J	4.1 U
Endrin	4.1 U	6.6 U	4.1 U
Endrin aldehyde	4.1 U	6.6 U	4.1 U
Endrin ketone	4.1 U	6.6 U	4.1 U
Heptachlor	2.1 U	3.4 U	2.1 U
Heptachlor epoxide	2.1 U	3.4 U	2.1 U
Methoxychlor	21 U	34 U	21 U
Toxaphene	210 U	340 U	210 U
alpha-BHC	2.1 U	3.4 U	2.1 U
alpha-Chlordane	2.1 U	3.4 U	2.1 U
beta-BHC	2.1 U	3.4 U	2.1 U
delta-BHC	2.1 U	3.4 U	2.1 U
gamma-BHC (Lindane)	2.1 U	3.4 U	2.1 U
gamma-Chlordane	2.1 U	3.4 U	2.1 U
Dioxin/Furans (UG/KG)			
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	NA	0.077	NA
1,2,3,4,6,7,8-Heptachlorodibenzofuran	NA	0.021	NA
1,2,3,4,7,8,9-Heptachlorodibenzofuran	NA	0.0017 B	NA
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	NA	0.0032 J	NA
1,2,3,4,7,8-Hexachlorodibenzofuran	NA	0.0048 J	NA
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	NA	0.0074 J	NA
1,2,3,6,7,8-Hexachlorodibenzofuran	NA	0.006 J	NA
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	NA	0.011	NA
1,2,3,7,8,9-Hexachlorodibenzofuran	NA	4.30E-04 B	NA
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	NA	0.0035 J	NA
1,2,3,7,8-Pentachlorodibenzofuran	NA	0.0064 J	NA
2,3,4,6,7,8-Hexachlorodibenzofuran	NA	0.0062 J	NA
2,3,4,7,8-Pentachlorodibenzofuran	NA	0.0078 J	NA
2,3,7,8-TCDD (dioxin)	NA	0.0012 B	NA
2,3,7,8-Tetrachlorodibenzofuran	NA	0.0096 J	NA
Octachlorodibenzo-p-dioxin	NA	0.96	NA
Octachlorodibenzofuran	NA	0.014 J	NA
Total Metals (MG/KG)			
Aluminum	9,250	18,100	7,200
Antimony	0.42 R	8 L	0.49 R
Arsenic	7.6	18.4	5.7
Barium	90	991	52.8
Beryllium	0.17 J	0.72 J	0.2 J
Cadmium	0.86 J	14.9	0.049 U
Calcium	1,960 J	21,300 J	550 J
Chromium	21.2	66.3	14.9
Cobalt	4.1 J	15.7 J	1.9 J
Copper	166 J	99,700 J	235 J
Cyanide	0.17 U	0.52 J	0.15 U
Iron	18,400	66,400	13,100
Lead	228	2,950	92.7
Magnesium	1,920	4,440	1,190 J
Manganese	172	697	53.2
Mercury	0.63	0.34	0.21
Nickel	13	107	5.6 J
Potassium	1,260	2,650	1,160 J
Selenium	0.63 UL	1.1 UL	0.74 UL
Silver	2.8	23.4	2 J
Sodium	75.1 B	1,310 J	221 J
Thallium	0.42 U	3.1 J	0.49 U
Vanadium	26.3	35.4	20.5
Zinc	383	11,500	62.1

Notes:
Shaded cells indicate detections
B - Possible blank contamination
J - Analyte present. Result may not be accurate or preci
L - Analyte present. Reported result may be biased low.
U - Not Detected
K - Analyte present. Reported result may be biased high
P - Duplicate sample
NA - Not analyzed

Table D-3
Groundwater Analytical Results
Site 5 Expanded Remedial Investigation
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	SJS05-MW01D		SJS05-MW02S		SJS05-MW03S
Sample ID	SJS05-MW01D-03D-P	SJS05-MW01D-03D	SJS05-MW02S-03D-P	SJS05-MW02S-03D	SJS05-MW03S-03D
Sample Date	12/15/03	12/15/03	12/15/03	12/15/03	12/15/03
Chemical Name					
Explosives (UG/L)					
RDX	0.2 U	0.2 U	NA	NA	NA
Total Metals (UG/L)					
Aluminum	NA	NA	21,800	21,500	11,400
Antimony	NA	NA	2 U	2 U	2 U
Arsenic	NA	NA	5.9 J	5.9 J	5.8 J
Barium	NA	NA	22.8 J	22.4 J	19.8 J
Beryllium	NA	NA	5.5	5.4	7.6
Cadmium	NA	NA	2.1 J	2.2 J	4.8 J
Calcium	NA	NA	58,200	57,000	65,600
Chromium	NA	NA	0.6 U	0.6 U	0.6 U
Cobalt	NA	NA	62.9	62.6	72.5
Copper	NA	NA	20.1 J	19.1 J	1.4 B
Cyanide	NA	NA	3 UL	3 UL	3 UL
Iron	NA	NA	18,400	18,400	24,800
Lead	NA	NA	9.8	9.4	6.4
Magnesium	NA	NA	45,400	44,800	52,400
Manganese	NA	NA	2,060	2,040	3,870
Mercury	NA	NA	0.13 U	0.13 U	0.15 U
Nickel	NA	NA	103	102	121
Potassium	NA	NA	15,900	15,100	29,500
Selenium	NA	NA	3 UL	3 UL	3 UL
Silver	NA	NA	0.48 J	0.81 J	1.4 J
Sodium	NA	NA	269,000	268,000	90,200
Thallium	NA	NA	2 U	2 U	2 U
Vanadium	NA	NA	3 J	3.2 J	1.3 J
Zinc	NA	NA	774	764	957
Dissolved Metals (UG/L)					
Aluminum	NA	NA	22,100	22,400	11,400
Antimony	NA	NA	2 U	2 U	2 U
Arsenic	NA	NA	6 J	6.9 J	6 J
Barium	NA	NA	27.3 J	25.5 J	22.1 J
Beryllium	NA	NA	5.5	5.8	7.5
Cadmium	NA	NA	2.3 J	2.4 J	5 J
Calcium	NA	NA	58,800	60,300	65,300
Chromium	NA	NA	0.6 U	0.6 U	0.6 U
Cobalt	NA	NA	64.1	64.4	71.6
Copper	NA	NA	25.5	22.4 J	4.8 B
Iron	NA	NA	18,200 J	19,000 J	22,900 J
Lead	NA	NA	10.6	12.7	7.8
Magnesium	NA	NA	46,100 J	46,600 J	51,700 J
Manganese	NA	NA	2,090 J	2,120 J	3,790 J
Mercury	NA	NA	0.13 U	0.13 U	0.16 U
Nickel	NA	NA	104	105	121
Potassium	NA	NA	16,700 J	16,800 J	29,100 J
Selenium	NA	NA	3 U	3 U	3 U
Silver	NA	NA	0.8 J	0.53 J	1.6 J
Sodium	NA	NA	270,000	273,000	87,700
Thallium	NA	NA	2 U	2 U	2 U
Vanadium	NA	NA	2.9 J	2.8 J	0.72 J
Zinc	NA	NA	772	810	940

Notes:

Shaded cells indicate detections

NA - Not analyzed

U - Not detected

J - Analyte present. Reported result may be biased.

B - Possible Blank Contamination

Appendix E

Table 1
Selection of Exposure Pathways
Site 5
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current / Future	Surface Soil	Surface Soil	At Site 5	Trespasser	Adult	Dermal	On-Site	Quant	Trespassers may have exposed skin surfaces come into contact with soil
						Ingestion	On-Site	Quant	Trespassers may incidentally ingest soil
					Adolescent	Dermal	On-Site	Quant	Trespassers may have exposed skin surfaces come into contact with soil
						Ingestion	On-Site	Quant	Trespassers may incidentally ingest soil
				Other Worker	Adult	Dermal	On-Site	Quant	Workers may have exposed skin surfaces come into contact with soil
						Ingestion	On-Site	Quant	Workers may incidentally ingest soil
		Air	Emissions from Surface Soil at Site 5	Trespasser	Adult	Inhalation	On-Site	Quant	Trespassers may inhale volatiles/particulates
					Adolescent	Inhalation	On-Site	Quant	Trespassers may inhale volatiles/particulates
Future	Surface Soil	Surface Soil	At Site 5	Resident	Adult	Dermal	On-Site	Quant	Residents may have exposed skin surfaces come into contact with soil
						Ingestion	On-Site	Quant	Residents may incidentally ingest soil
					Child	Dermal	On-Site	Quant	Residents may have exposed skin surfaces come into contact with soil
						Ingestion	On-Site	Quant	Residents may incidentally ingest soil
					Adult/Child	Dermal	On-Site	Quant	Residents may have exposed skin surfaces come into contact with soil
						Ingestion	On-Site	Quant	Residents may incidentally ingest soil

Table 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 5

St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
At Site 5	540-59-0	1,2-Dichloroethene (total)	1.00E-03 J	1.00E-03 J	MG/KG	SJS05-SS08-000	1/34	0.01 - 0.022	1.00E-03	ND	9.20E+02 N	N/A	N/A	NO	BSL
	78-93-3	2-Butanone	2.80E-02	2.10E-01	MG/KG	SJS05-SS06-000	2/34	0.01 - 0.022	2.10E-01	ND	6.13E+04 N	N/A	N/A	NO	BSL
	67-64-1	Acetone	9.00E-03 J	6.20E-02	MG/KG	SJS05-SS14-000	11/34	0.01 - 0.022	6.20E-02	ND	9.20E+04 N	N/A	N/A	NO	BSL
	67-66-3	Chloroform	2.00E-03 J	2.00E-03 J	MG/KG	SJS05-SS26-000	1/34	0.01 - 0.022	2.00E-03	NS	1.02E+03 N	N/A	N/A	NO	BSL
	74-87-3	Chloromethane	3.00E-03 J	5.00E-03 J	MG/KG	SJS05-SS26-000	2/34	0.01 - 0.022	5.00E-03	NS	N/A	N/A	N/A	NO	NTX
	75-09-2	Methylene chloride	2.00E-03 J	1.71E-01	MG/KG	SJS05-SS12-000	10/34	0.01 - 0.022	1.71E-01	ND	3.82E+02 C	N/A	N/A	NO	BSL
	100-42-5	Styrene	2.90E-02	2.90E-02	MG/KG	SJS05-SS34-000	1/34	0.01 - 0.022	2.90E-02	ND	2.04E+04 N	N/A	N/A	NO	BSL
	127-18-4	Tetrachloroethene	1.00E-03 J	4.00E-03 J	MG/KG	SJS05-SS09-000	3/34	0.01 - 0.022	4.00E-03	ND	5.30E+00 C	N/A	N/A	NO	BSL
	108-88-3	Toluene	2.00E-03 J	5.00E-03 J	MG/KG	SJS05-SS09-000	5/34	0.01 - 0.022	5.00E-03	ND	2.04E+04 N	N/A	N/A	NO	BSL
	79-01-6	Trichloroethene	2.00E-03 J	5.80E-02	MG/KG	SJS05-SS27-000	10/34	0.01 - 0.022	5.80E-02	ND	5.20E+02 C	N/A	N/A	NO	BSL
	1330-20-7	Xylene, total	2.00E-03 J	3.00E-03 J	MG/KG	SJS05-SS05-000	2/34	0.01 - 0.022	3.00E-03	ND	2.04E+04 N	N/A	N/A	NO	BSL
	121-14-2	2,4-Dinitrotoluene	4.30E-02 J	3.20E+00 J	MG/KG	SJS05-SS03-000	8/38	0.33 - 2	3.20E+00	ND	2.04E+02 N	N/A	N/A	NO	BSL
	606-20-2	2,6-Dinitrotoluene	3.90E-02 J	3.90E-02 J	MG/KG	SJS05-SS01-000	1/38	0.33 - 2	3.90E-02	ND	1.02E+02 N	N/A	N/A	NO	BSL
	91-57-6	2-Methylnaphthalene	4.20E-02 J	5.70E-02 J	MG/KG	SJS05-SS45-00-03D	2/66	0.33 - 2	5.70E-02	ND	4.10E+02 N	N/A	N/A	NO	BSL
	100-01-6	4-Nitroaniline	4.60E-01 J	4.60E-01 J	MG/KG	SJS05-SS37P-000	1/38	0.83 - 5	4.60E-01	NS	1.43E+02 C	N/A	N/A	NO	BSL
	83-32-9	Acenaphthene	4.10E-02 J	4.10E-02 J	MG/KG	SJS05-SS04-000	1/66	0.33 - 2	4.10E-02	6.00E-01	6.13E+03 N	N/A	N/A	NO	BSL
	208-96-8	Acenaphthylene	1.80E-02 J	5.40E-01	MG/KG	SJS05-SS41-00-03D SJS05-SS20-000	17/66	0.33 - 2	5.40E-01	2.00E-01	2.04E+03 N	N/A	N/A	NO	BSL
	120-12-7	Anthracene	1.80E-02 J	4.50E-01 J	MG/KG	SJS05-SS41-00-03D	17/66	0.33 - 2	4.50E-01	5.00E-01	3.07E+04 N	N/A	N/A	NO	BSL
	56-55-3	Benzo(a)anthracene	2.70E-02 J	1.50E+00	MG/KG	SJS05-SS41-00-03D	50/66	0.33 - 2	1.50E+00	2.00E+00	3.92E+00 C	N/A	N/A	NO	BSL
	50-32-8	Benzo(a)pyrene	3.50E-02 J	1.20E+00 J	MG/KG	SJS05-SS26-000	47/66	0.33 - 2	1.20E+00	2.00E+00	3.92E-01 C	N/A	N/A	YES	ASL
	205-99-2	Benzo(b)fluoranthene	3.10E-02 J	2.70E+00	MG/KG	SJS05-SS41-00-03D	54/66	0.33 - 2	2.70E+00	3.00E+00	3.92E+00 C	N/A	N/A	NO	BSL
	191-24-2	Benzo(g,h,i)perylene	5.20E-02 J	2.30E+00	MG/KG	SJS05-SS66-00-03D	42/66	0.33 - 2	2.30E+00	2.00E+00	3.07E+03 N	N/A	N/A	NO	BSL
	207-08-9	Benzo(k)fluoranthene	2.70E-02 J	8.20E-01	MG/KG	SJS05-SS41-00-03D	45/66	0.33 - 2	8.20E-01	2.00E+00	3.92E+01 C	N/A	N/A	NO	BSL
	86-74-8	Carbazole	1.40E-02 J	6.90E-02 J	MG/KG	SJS05-SS26-000	4/38	0.33 - 2	6.90E-02	ND	1.43E+02 C	N/A	N/A	NO	BSL
	218-01-9	Chrysene	3.30E-02 J	2.20E+00	MG/KG	SJS05-SS41-00-03D	53/66	0.33 - 2	2.20E+00	3.00E+00	3.92E+02 C	N/A	N/A	NO	BSL
	84-74-2	Di-n-butylphthalate	2.10E-02 J	4.70E+00	MG/KG	SJS05-SS03-000	14/38	0.33 - 2	4.70E+00	ND	1.02E+04 N	N/A	N/A	NO	BSL
	53-70-3	Dibenz(a,h)anthracene	3.80E-02 J	5.60E-01 J	MG/KG	SJS05-SS66-00-03D	16/66	0.33 - 2	5.60E-01	7.00E-01	3.92E-01 C	N/A	N/A	YES	ASL
	84-66-2	Diethylphthalate	1.70E-01 J	1.70E-01 J	MG/KG	SJS05-SS12-000	1/38	0.33 - 2	1.70E-01	ND	8.18E+04 N	N/A	N/A	NO	BSL
	131-11-3	Dimethyl phthalate	6.30E-02 J	6.30E-02 J	MG/KG	SJS05-SS12-000	1/38	0.33 - 2	6.30E-02	ND	1.02E+06 N	N/A	N/A	NO	BSL
	206-44-0	Fluoranthene	4.90E-02 J	2.00E+00 J	MG/KG	SJS05-SS03-000	52/66	0.33 - 2	2.00E+00	3.00E+00	4.09E+03 N	N/A	N/A	NO	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	2.80E-02 J	1.60E+00	MG/KG	SJS05-SS66-00-03D	46/66	0.33 - 2	1.60E+00	2.00E+00	3.92E+00 C	N/A	N/A	NO	BSL
	91-20-3	Naphthalene	1.20E-02 J	9.00E-02 J	MG/KG	SJS05-SS35-000	6/66	0.33 - 2	9.00E-02	5.00E-01	2.04E+03 N	N/A	N/A	NO	BSL
	85-01-8	Phenanthrene	2.50E-02 J	3.90E-01 J	MG/KG	SJS05-SS41-00-03D	38/66	0.33 - 2	3.90E-01	9.00E-01	3.07E+03 N	N/A	N/A	NO	BSL
	129-00-0	Pyrene	4.30E-02 J	1.30E+00 J	MG/KG	SJS05-SS26-000	53/66	0.33 - 2	1.30E+00	3.00E+00	3.07E+03 N	N/A	N/A	NO	BSL
	117-81-7	bis(2-Ethylhexyl)phthalate	6.60E-02 J	1.80E-01 J	MG/KG	SJS05-SS12-000	4/38	0.28 - 2	1.80E-01	ND	2.04E+02 C	N/A	N/A	NO	BSL
	86-30-6	n-Nitrosodiphenylamine	1.20E-01 J	5.30E-01 UJ	MG/KG	SJS05-SS03-000 SJS05-SS21-000	3/38	0.33 - 2	5.30E-01	ND	5.84E+02 C	N/A	N/A	NO	BSL

Table 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 5

St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
	72-54-8	4,4'-DDD	4.60E-04 J	3.10E-01 J	MG/KG	SJS05-SS09-000	43/61	3.29E-03 - 0.057	3.10E-01	5.00E-03	1.19E+01 C	N/A	N/A	NO	BSL
	72-55-9	4,4'-DDE	5.30E-04 J	4.70E+00 J	MG/KG	SJS05-SS35-000	59/62	3.29E-03 - 0.6	4.70E+00	9.00E-03	8.42E+00 C	N/A	N/A	NO	BSL
	50-29-3	4,4'-DDT	2.20E-03 J	3.10E+00 J	MG/KG	SJS05-SS32-000 SJS05-SS35-000	56/62	3.29E-03 - 0.6	3.10E+00	2.00E-02	8.42E+00 C	N/A	N/A	NO	BSL
	11096-82-5	Aroclor-1260	3.00E-02 J	3.90E-02 UJ	MG/KG	SJS05-SS08-000 SJS05-SS33-000	2/34	0.033 - 0.37	3.90E-02	ND	1.43E+00 C	N/A	N/A	NO	BSL
	60-57-1	Dieldrin	1.30E-03 J	6.80E-03	MG/KG	SJS05-SS08-000	3/62	3.29E-03 - 0.057	6.80E-03	5.00E-03	1.79E-01 C	N/A	N/A	NO	BSL
	1031-07-8	Endosulfan sulfate	5.40E-03 J	1.10E-02 J	MG/KG	SJS05-SS53-00-03D	4/62	3.29E-03 - 0.057	1.10E-02	NS	6.13E+02 N	N/A	N/A	NO	BSL
	53494-70-5	Endrin ketone	5.60E-03 J	2.00E-02	MG/KG	SJS05-SS53-00-03D	3/62	3.29E-03 - 0.057	2.00E-02	NS	3.07E+01 N	N/A	N/A	NO	BSL
	319-84-6	alpha-BHC	3.50E-03	3.50E-03 UJ	MG/KG	SJS05-SS08-000 SJS05-SS23-000	1/62	0.0017 - 0.029	3.50E-03	ND	4.54E-01 C	N/A	N/A	NO	BSL
	5103-71-9	alpha-Chlordane	5.80E-04 J	2.40E-03 J	MG/KG	SJS05-SS08-000	3/62	0.0017 - 0.029	2.40E-03	3.00E-03	8.18E+00 C	N/A	N/A	NO	BSL
	5103-74-2	gamma-Chlordane	2.60E-03 J	2.60E-03 J	MG/KG	SJS05-SS08-000	1/62	0.0017 - 0.029	2.60E-03	3.00E-03	8.18E+00 C	N/A	N/A	NO	BSL
	35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	5.60E-05	1.80E-04	MG/KG	SJS05-SS50-00-03D-P	4/4	0.00000036 - 0.00000039	1.80E-04	NS	1.91E-03 C	N/A	N/A	NO	BSL
	67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.00E-05	8.40E-05	MG/KG	SJS05-SS44-00-03D	4/4	0.00000014 - 0.00000031	8.40E-05	NS	1.91E-03 C	N/A	N/A	NO	BSL
	55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.80E-06 J	7.70E-06	MG/KG	SJS05-SS44-00-03D	2/4	0.00000019 - 0.00000033	7.70E-06	NS	1.91E-03 C	N/A	N/A	NO	BSL
	39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	1.60E-06 Q	5.90E-06 J	MG/KG	SJS05-SS50-00-03D-P	4/4	0.00000015 - 0.00000037	5.90E-06	NS	1.91E-04 C	N/A	N/A	NO	BSL
	70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran	3.10E-06 J	3.50E-05	MG/KG	SJS05-SS44-00-03D	4/4	0.00000011 - 0.00000026	3.50E-05	NS	1.91E-04 C	N/A	N/A	NO	BSL
	57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	3.60E-06 J	9.10E-06	MG/KG	SJS05-SS50-00-03D-P	4/4	0.00000017 - 0.00000041	9.10E-06	NS	1.91E-04 C	N/A	N/A	NO	BSL
	57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran	1.60E-06 J	1.30E-05	MG/KG	SJS05-SS44-00-03D	4/4	0.00000012 - 0.00000026	1.30E-05	NS	1.91E-04 C	N/A	N/A	NO	BSL
	19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	5.30E-06 J	1.70E-05	MG/KG	SJS05-SS50-00-03D-P	4/4	0.00000015 - 0.00000037	1.70E-05	NS	4.62E-04 C	N/A	N/A	NO	BSL
	72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran	9.00E-07 J	9.00E-07 J	MG/KG	SJS05-SS44-00-03D	1/4	0.00000014 - 0.00000024	9.00E-07	NS	1.91E-04 C	N/A	N/A	NO	BSL
	40321-76-4	1,2,3,7,8-Pentachlorodibenzo-p-dioxin	1.30E-06 J	4.40E-06 J	MG/KG	SJS05-SS50-00-03D-P	4/4	0.00000019 - 0.00000041	4.40E-06	NS	1.91E-05 C	N/A	N/A	NO	BSL
	57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran	1.60E-06 J	7.30E-06	MG/KG	SJS05-SS44-00-03D	4/4	0.0000002 - 0.00000042	7.30E-06	NS	3.82E-04 C	N/A	N/A	NO	BSL
	60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran	1.40E-06 Q	1.90E-05	MG/KG	SJS05-SS44-00-03D	4/4	0.00000012 - 0.00000017	1.90E-05	NS	1.91E-04 C	N/A	N/A	NO	BSL
	57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran	2.00E-06 J	1.10E-05	MG/KG	SJS05-SS44-00-03D	4/4	0.00000015 - 0.00000023	1.10E-05	NS	3.82E-05 C	N/A	N/A	NO	BSL
	51207-31-9	2,3,7,8-Tetrachlorodibenzofuran	1.70E-06 Q	9.60E-06 J	MG/KG	SJS05-SS66-00-03D	4/4	0.00000035 - 0.00000078	9.60E-06	NS	1.91E-04 C	N/A	N/A	NO	BSL
	3268-87-9	Octachlorodibenzo-p-dioxin	3.80E-04	2.40E-03	MG/KG	SJS05-SS50-00-03D-P	4/4	0.00000025 - 0.00000048	2.40E-03	NS	1.90E+00 C	N/A	N/A	NO	BSL
	39001-02-0	Octachlorodibenzofuran	1.10E-05	1.00E-04	MG/KG	SJS05-SS44-00-03D	4/4	0.00000018 - 0.0000003	1.00E-04	NS	1.90E+00 C	N/A	N/A	NO	BSL
	121-14-2	2,4-Dinitrotoluene	3.03E-01	6.38E-01	MG/KG	SJS05-SS14-000	2/26	0.2 - 0.54	6.38E-01	ND	2.04E+02 N	N/A	N/A	NO	BSL
	35572-78-2	2-Amino-4,6-dinitrotoluene	4.17E-01	4.17E-01	MG/KG	SJS05-SS24-000	1/26	0.2 - 0.54	4.17E-01	NA	2.00E+01	N/A	N/A	NO	BSL
	7429-90-5	Aluminum	9.00E+02	2.22E+04	MG/KG	SJS05-SS49-00-03D	66/66	5.8 - 92	2.22E+04	2.28E+04	1.02E+05 N	N/A	N/A	NO	BSL
	7440-36-0	Antimony	5.10E-01 L	5.65E+01 L	MG/KG	SJS05-SS44-00-03D	25/51	0.31 - 28	5.65E+01	1.00E+00	4.09E+01 N	N/A	N/A	YES	ASL
	7440-38-2	Arsenic	8.80E-01 J	1.52E+02	MG/KG	SJS05-SS11-000	66/66	0.3 - 4.6	1.52E+02	2.40E+01	1.91E+00 C	N/A	N/A	YES	ASL
	7440-39-3	Barium	9.10E+00 J	2.39E+04	MG/KG	SJS05-SS36-000	66/66	2.99E-02 - 92	2.39E+04	9.80E+01	7.15E+03 N	N/A	N/A	YES	ASL
	7440-41-7	Beryllium	6.10E-02 J	1.30E+00 J	MG/KG	SJS05-SS18-000 SJS05-SS24-000	66/66	1.99E-02 - 2.3	1.30E+00	1.00E+00	2.04E+02 N	N/A	N/A	NO	BSL
	7440-43-9	Cadmium	6.00E-02 J	4.78E+01 J	MG/KG	SJS05-SS38-000	47/66	5.0E-02 - 2.3	4.78E+01	ND	1.02E+02 N	N/A	N/A	NO	BSL
	7440-70-2	Calcium	2.30E+02 J	1.65E+05 J	MG/KG	SJS05-SS51-00-03D	66/66	8.80 - 5500	1.65E+05	3.25E+03	N/A	N/A	N/A	NO	NUT
	7440-47-3	Chromium	2.50E+00	8.67E+02	MG/KG	SJS05-SS19-000	66/66	0.17 - 4.6	8.67E+02	4.50E+01	3.07E+02 N	N/A	N/A	YES	ASL
	7440-48-4	Cobalt	3.90E-01 J	1.77E+01	MG/KG	SJS05-SS01-000	64/66	7.99E-02 - 23	1.77E+01	1.30E+01	2.04E+03 N	N/A	N/A	NO	BSL

Table 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 5

St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
	7440-50-8	Copper	4.20E+00 J	2.09E+05 J	MG/KG	SJS05-SS44-00-03D	66/66	0.17 - 320	2.09E+05	5.80E+01	4.09E+03 N	N/A	N/A	YES	ASL
	57-12-5	Cyanide	2.10E-01 J	5.20E+00	MG/KG	SJS05-SS51-00-03D	18/59	0.17 - 1.1	5.20E+00	ND	2.04E+03 N	N/A	N/A	NO	BSL
	7439-89-6	Iron	1.73E+03	1.20E+05	MG/KG	SJS05-SS01-000	66/66	2.66 - 46	1.20E+05	6.13E+04	3.07E+04 N	N/A	N/A	YES	ASL
	7439-92-1	Lead	1.04E+01	7.21E+03 J	MG/KG	SJS05-SS01-000	66/66	0.15 - 1.4	7.21E+03	1.47E+02	4.00E+02	N/A	N/A	YES	ASL
	7439-95-4	Magnesium	2.37E+02 J	9.82E+03	MG/KG	SJS05-SS36-000	66/66	3.7 - 2300	9.82E+03	4.51E+03	N/A	N/A	N/A	NO	NUT
	7439-96-5	Manganese	1.60E+01 K	1.87E+03	MG/KG	SJS05-SS36-000	66/66	5.0E-02 - 6.9	1.87E+03	1.98E+02	2.04E+03 N	N/A	N/A	NO	BSL
	7439-97-6	Mercury	3.00E-02 J	1.10E+00	MG/KG	SJS05-SS33-000	58/65	9.9E-03 - 0.24	1.10E+00	1.00E+00	3.10E+01	N/A	N/A	NO	BSL
	7440-02-0	Nickel	1.50E+00 J	1.98E+02	MG/KG	SJS05-SS44-00-03D	65/66	0.140 - 18	1.98E+02	1.90E+01	2.04E+03 N	N/A	N/A	NO	BSL
	7440-09-7	Potassium	2.23E+02 J	4.43E+03	MG/KG	SJS05-SS35-000	60/66	2 - 2300	4.43E+03	4.58E+03	N/A	N/A	N/A	NO	NUT
	7782-49-2	Selenium	4.90E-01 J	6.10E+00 L	MG/KG	SJS05-SS44-00-03D	13/66	0.4 - 2.3	6.10E+00	2.00E+00	5.11E+02 N	N/A	N/A	NO	BSL
	7440-22-4	Silver	3.10E-01 J	2.34E+01	MG/KG	SJS05-SS66-00-03D	33/66	0.14 - 4.6	2.34E+01	7.00E-01	5.11E+02 N	N/A	N/A	NO	BSL
	7440-23-5	Sodium	5.86E+01 J	6.41E+03	MG/KG	SJS05-SS18-000	38/66	9.07 - 2300	6.41E+03	6.20E+02	N/A	N/A	N/A	NO	NUT
	7440-28-0	Thallium	4.50E-01 J	7.70E+00	MG/KG	SJS05-SS44-00-03D	19/66	0.31 - 4.6	7.70E+00	ND	7.15E+00 N	N/A	N/A	YES	ASL
	7440-62-2	Vanadium	5.00E+00 J	6.91E+01	MG/KG	SJS05-SS35-000	66/66	9.0E-02 - 23	6.91E+01	1.43E+03	1.00E+02 N	N/A	N/A	NO	BSL
	7440-66-6	Zinc	2.00E+01	1.24E+05	MG/KG	SJS05-SS44-00-03D	66/66	0.28 - 260	1.24E+05	6.13E+04	3.07E+04 N	N/A	N/A	YES	ASL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Dredge Fill Background Upper Tolerance Limit (UTL) from CH2M Hill Final Background Investigation Report. St. Juliens Creek Annex, Chesapeake, Virginia. October 2001.

[4] Risk-Based Concentration Table for Industrial Soil, April 14, 2004, U.S. EPA Region III, Jennifer Hubbard.

RBC values for dioxin congeners calculated by adjusting 2,3,7,8-TCDD RBC with appropriate factors from WHO, 1998.

RBC value for trichloroethene is calculated using 1997 NCEA toxicity numbers, and equations in RBC Table.

RBC value for pyrene used as surrogate for phenanthrene and benzo(g,h,i)perylene.

RBC value for endosulfan used as surrogate for endosulfan I, endosulfan II, and endosulfan sulfate.

RBC value for endrin used as surrogate for endrin aldehyde and endrin ketone.

RBC value for chromium VI used for total chromium.

Lead screening toxicity value is 400 mg/kg, the EPA residential soil screening level for lead.

RBC value for manganese-nonfood used as surrogate for manganese.

RBC value for mercuric chloride used as surrogate for mercury.

[5] RBC value for napthalene used as surrogate for acenaphthylene.

Rationale Codes

Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)

SQL = Sample Quantification Limit

COPC = Chemical of Potential Concern

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered

J = Estimated Value

K = Biased High

L = Biased Low

C = Carcinogenic

N = Noncarcinogenic

ND - Compounds were analyzed but not detected during Background Investigation

NS- Compounds were not sampled for during Background Investigation

Table 2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 5

St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
At Site 5	540-59-0	1,2-Dichloroethene (total)	1.00E-03 J	1.00E-03 J	MG/KG	SJS05-SS08-000	1/34	0.01 - 0.022	1.00E-03	ND	9.20E+02 N	N/A	N/A	NO	BSL
	78-93-3	2-Butanone	2.80E-02	2.10E-01	MG/KG	SJS05-SS06-000	2/34	0.01 - 0.022	2.10E-01	ND	6.13E+04 N	N/A	N/A	NO	BSL
	67-64-1	Acetone	9.00E-03 J	6.20E-02	MG/KG	SJS05-SS14-000	11/34	0.01 - 0.022	6.20E-02	ND	9.20E+04 N	N/A	N/A	NO	BSL
	67-66-3	Chloroform	2.00E-03 J	2.00E-03 J	MG/KG	SJS05-SS26-000	1/34	0.01 - 0.022	2.00E-03	NS	1.02E+03 N	N/A	N/A	NO	BSL
	74-87-3	Chloromethane	3.00E-03 J	5.00E-03 J	MG/KG	SJS05-SS26-000	2/34	0.01 - 0.022	5.00E-03	NS	N/A	N/A	N/A	NO	NTX
	75-09-2	Methylene chloride	2.00E-03 J	1.71E-01	MG/KG	SJS05-SS12-000	10/34	0.01 - 0.022	1.71E-01	ND	3.82E+02 C	N/A	N/A	NO	BSL
	100-42-5	Styrene	2.90E-02	2.90E-02	MG/KG	SJS05-SS34-000	1/34	0.01 - 0.022	2.90E-02	ND	2.04E+04 N	N/A	N/A	NO	BSL
	127-18-4	Tetrachloroethene	1.00E-03 J	4.00E-03 J	MG/KG	SJS05-SS09-000	3/34	0.01 - 0.022	4.00E-03	ND	5.30E+00 C	N/A	N/A	NO	BSL
	108-88-3	Toluene	2.00E-03 J	5.00E-03 J	MG/KG	SJS05-SS09-000	5/34	0.01 - 0.022	5.00E-03	ND	2.04E+04 N	N/A	N/A	NO	BSL
	79-01-6	Trichloroethene	2.00E-03 J	5.80E-02	MG/KG	SJS05-SS27-000	10/34	0.01 - 0.022	5.80E-02	ND	5.20E+02 C	N/A	N/A	NO	BSL
	1330-20-7	Xylene, total	2.00E-03 J	3.00E-03 J	MG/KG	SJS05-SS05-000	2/34	0.01 - 0.022	3.00E-03	ND	2.04E+04 N	N/A	N/A	NO	BSL
	121-14-2	2,4-Dinitrotoluene	4.30E-02 J	3.20E+00 J	MG/KG	SJS05-SS03-000	8/38	0.33 - 2	3.20E+00	ND	2.04E+02 N	N/A	N/A	NO	BSL
	606-20-2	2,6-Dinitrotoluene	3.90E-02 J	3.90E-02 J	MG/KG	SJS05-SS01-000	1/38	0.33 - 2	3.90E-02	ND	1.02E+02 N	N/A	N/A	NO	BSL
	91-57-6	2-Methylnaphthalene	4.20E-02 J	5.70E-02 J	MG/KG	SJS05-SS45-00-03D	2/66	0.33 - 2	5.70E-02	ND	4.10E+02 N	N/A	N/A	NO	BSL
	100-01-6	4-Nitroaniline	4.60E-01 J	4.60E-01 J	MG/KG	SJS05-SS37P-000	1/38	0.83 - 5	4.60E-01	NS	1.43E+02 C	N/A	N/A	NO	BSL
	83-32-9	Acenaphthene	4.10E-02 J	4.10E-02 J	MG/KG	SJS05-SS04-000	1/66	0.33 - 2	4.10E-02	6.00E-01	6.13E+03 N	N/A	N/A	NO	BSL
	208-96-8	Acenaphthylene	1.80E-02 J	5.40E-01	MG/KG	S05-SS41-00-03D SJS05-SS20-(	17/66	0.33 - 2	5.40E-01	2.00E-01	2.04E+03 N	N/A	N/A	NO	BSL
	120-12-7	Anthracene	1.80E-02 J	4.50E-01 J	MG/KG	SJS05-SS41-00-03D	17/66	0.33 - 2	4.50E-01	5.00E-01	3.07E+04 N	N/A	N/A	NO	BSL
	56-55-3	Benzo(a)anthracene	2.70E-02 J	1.50E+00	MG/KG	SJS05-SS41-00-03D	50/66	0.33 - 2	1.50E+00	2.00E+00	3.92E+00 C	N/A	N/A	NO	BSL
	50-32-8	Benzo(a)pyrene	3.50E-02 J	1.20E+00 J	MG/KG	SJS05-SS26-000	47/66	0.33 - 2	1.20E+00	2.00E+00	3.92E-01 C	N/A	N/A	YES	ASL
	205-99-2	Benzo(b)fluoranthene	3.10E-02 J	2.70E+00	MG/KG	SJS05-SS41-00-03D	54/66	0.33 - 2	2.70E+00	3.00E+00	3.92E+00 C	N/A	N/A	NO	BSL
	191-24-2	Benzo(g,h,i)perylene	5.20E-02 J	2.30E+00	MG/KG	SJS05-SS66-00-03D	42/66	0.33 - 2	2.30E+00	2.00E+00	3.07E+03 N	N/A	N/A	NO	BSL
	207-08-9	Benzo(k)fluoranthene	2.70E-02 J	8.20E-01	MG/KG	SJS05-SS41-00-03D	45/66	0.33 - 2	8.20E-01	2.00E+00	3.92E+01 C	N/A	N/A	NO	BSL
	86-74-8	Carbazole	1.40E-02 J	6.90E-02 J	MG/KG	SJS05-SS26-000	4/38	0.33 - 2	6.90E-02	ND	1.43E+02 C	N/A	N/A	NO	BSL
	218-01-9	Chrysene	3.30E-02 J	2.20E+00	MG/KG	SJS05-SS41-00-03D	53/66	0.33 - 2	2.20E+00	3.00E+00	3.92E+02 C	N/A	N/A	NO	BSL
	84-74-2	Di-n-butylphthalate	2.10E-02 J	4.70E+00	MG/KG	SJS05-SS03-000	14/38	0.33 - 2	4.70E+00	ND	1.02E+04 N	N/A	N/A	NO	BSL
	53-70-3	Dibenz(a,h)anthracene	3.80E-02 J	5.60E-01 J	MG/KG	SJS05-SS66-00-03D	16/66	0.33 - 2	5.60E-01	7.00E-01	3.92E-01 C	N/A	N/A	YES	ASL
	84-66-2	Diethylphthalate	1.70E-01 J	1.70E-01 J	MG/KG	SJS05-SS12-000	1/38	0.33 - 2	1.70E-01	ND	8.18E+04 N	N/A	N/A	NO	BSL
	131-11-3	Dimethyl phthalate	6.30E-02 J	6.30E-02 J	MG/KG	SJS05-SS12-000	1/38	0.33 - 2	6.30E-02	ND	1.02E+06 N	N/A	N/A	NO	BSL
	206-44-0	Fluoranthene	4.90E-02 J	2.00E+00 J	MG/KG	SJS05-SS03-000	52/66	0.33 - 2	2.00E+00	3.00E+00	4.09E+03 N	N/A	N/A	NO	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	2.80E-02 J	1.60E+00	MG/KG	SJS05-SS66-00-03D	46/66	0.33 - 2	1.60E+00	2.00E+00	3.92E+00 C	N/A	N/A	NO	BSL
	91-20-3	Naphthalene	1.20E-02 J	9.00E-02 J	MG/KG	SJS05-SS35-000	6/66	0.33 - 2	9.00E-02	5.00E-01	2.04E+03 N	N/A	N/A	NO	BSL
	85-01-8	Phenanthrene	2.50E-02 J	3.90E-01 J	MG/KG	SJS05-SS41-00-03D	38/66	0.33 - 2	3.90E-01	9.00E-01	3.07E+03 N	N/A	N/A	NO	BSL
	129-00-0	Pyrene	4.30E-02 J	1.30E+00 J	MG/KG	SJS05-SS26-000	53/66	0.33 - 2	1.30E+00	3.00E+00	3.07E+03 N	N/A	N/A	NO	BSL
	117-81-7	bis(2-Ethylhexyl)phthalate	6.60E-02 J	1.80E-01 J	MG/KG	SJS05-SS12-000	4/38	0.28 - 2	1.80E-01	ND	2.04E+02 C	N/A	N/A	NO	BSL
	86-30-6	n-Nitrosodiphenylamine	1.20E-01 J	5.30E-01 UJ	MG/KG	JS05-SS03-000 SJS05-SS21-00	3/38	0.33 - 2	5.30E-01	ND	5.84E+02 C	N/A	N/A	NO	BSL

Table 2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 5

St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
	72-54-8	4,4'-DDD	4.60E-04 J	3.10E-01 J	MG/KG	SJS05-SS09-000	43/61	3.29E-03 - 0.057	3.10E-01	5.00E-03	1.19E+01 C	N/A	N/A	NO	BSL
	72-55-9	4,4'-DDE	5.30E-04 J	4.70E+00 J	MG/KG	SJS05-SS35-000	59/62	3.29E-03 - 0.6	4.70E+00	9.00E-03	8.42E+00 C	N/A	N/A	NO	BSL
	50-29-3	4,4'-DDT	2.20E-03 J	3.10E+00 J	MG/KG	JS05-SS32-000 SJS05-SS35-00	56/62	3.29E-03 - 0.6	3.10E+00	2.00E-02	8.42E+00 C	N/A	N/A	NO	BSL
	11096-82-5	Aroclor-1260	3.00E-02 J	3.90E-02 UJ	MG/KG	JS05-SS08-000 SJS05-SS33-00	2/34	0.033 - 0.37	3.90E-02	ND	1.43E+00 C	N/A	N/A	NO	BSL
	60-57-1	Dieldrin	1.30E-03 J	6.80E-03	MG/KG	SJS05-SS08-000	3/62	3.29E-03 - 0.057	6.80E-03	5.00E-03	1.79E-01 C	N/A	N/A	NO	BSL
	1031-07-8	Endosulfan sulfate	5.40E-03 J	1.10E-02 J	MG/KG	SJS05-SS53-00-03D	4/62	3.29E-03 - 0.057	1.10E-02	NS	6.13E+02 N	N/A	N/A	NO	BSL
	53494-70-5	Endrin ketone	5.60E-03 J	2.00E-02	MG/KG	SJS05-SS53-00-03D	3/62	3.29E-03 - 0.057	2.00E-02	NS	3.07E+01 N	N/A	N/A	NO	BSL
	319-84-6	alpha-BHC	3.50E-03	3.50E-03 UJ	MG/KG	JS05-SS08-000 SJS05-SS23-00	1/62	0.0017 - 0.029	3.50E-03	ND	4.54E-01 C	N/A	N/A	NO	BSL
	5103-71-9	alpha-Chlordane	5.80E-04 J	2.40E-03 J	MG/KG	SJS05-SS08-000	3/62	0.0017 - 0.029	2.40E-03	3.00E-03	8.18E+00 C	N/A	N/A	NO	BSL
	5103-74-2	gamma-Chlordane	2.60E-03 J	2.60E-03 J	MG/KG	SJS05-SS08-000	1/62	0.0017 - 0.029	2.60E-03	3.00E-03	8.18E+00 C	N/A	N/A	NO	BSL
	35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	5.60E-05	1.80E-04	MG/KG	SJS05-SS50-00-03D-P	4/4	0.00000036 - 0.00000039	1.80E-04	NS	1.91E-03 C	N/A	N/A	NO	BSL
	67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.00E-05	8.40E-05	MG/KG	SJS05-SS44-00-03D	4/4	0.00000014 - 0.00000031	8.40E-05	NS	1.91E-03 C	N/A	N/A	NO	BSL
	55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.80E-06 J	7.70E-06	MG/KG	SJS05-SS44-00-03D	2/4	0.00000019 - 0.00000033	7.70E-06	NS	1.91E-03 C	N/A	N/A	NO	BSL
	39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	1.60E-06 Q	5.90E-06 J	MG/KG	SJS05-SS50-00-03D-P	4/4	0.00000015 - 0.00000037	5.90E-06	NS	1.91E-04 C	N/A	N/A	NO	BSL
	70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran	3.10E-06 J	3.50E-05	MG/KG	SJS05-SS44-00-03D	4/4	0.00000011 - 0.00000026	3.50E-05	NS	1.91E-04 C	N/A	N/A	NO	BSL
	57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	3.60E-06 J	9.10E-06	MG/KG	SJS05-SS50-00-03D-P	4/4	0.00000017 - 0.00000041	9.10E-06	NS	1.91E-04 C	N/A	N/A	NO	BSL
	57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran	1.60E-06 J	1.30E-05	MG/KG	SJS05-SS44-00-03D	4/4	0.00000012 - 0.00000026	1.30E-05	NS	1.91E-04 C	N/A	N/A	NO	BSL
	19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	5.30E-06 J	1.70E-05	MG/KG	SJS05-SS50-00-03D-P	4/4	0.00000015 - 0.00000037	1.70E-05	NS	4.62E-04 C	N/A	N/A	NO	BSL
	72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran	9.00E-07 J	9.00E-07 J	MG/KG	SJS05-SS44-00-03D	1/4	0.00000014 - 0.00000024	9.00E-07	NS	1.91E-04 C	N/A	N/A	NO	BSL
	40321-76-4	1,2,3,7,8-Pentachlorodibenzo-p-dioxin	1.30E-06 J	4.40E-06 J	MG/KG	SJS05-SS50-00-03D-P	4/4	0.00000019 - 0.00000041	4.40E-06	NS	1.91E-05 C	N/A	N/A	NO	BSL
	57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran	1.60E-06 J	7.30E-06	MG/KG	SJS05-SS44-00-03D	4/4	0.0000002 - 0.00000042	7.30E-06	NS	3.82E-04 C	N/A	N/A	NO	BSL
	60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran	1.40E-06 Q	1.90E-05	MG/KG	SJS05-SS44-00-03D	4/4	0.00000012 - 0.00000017	1.90E-05	NS	1.91E-04 C	N/A	N/A	NO	BSL
	57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran	2.00E-06 J	1.10E-05	MG/KG	SJS05-SS44-00-03D	4/4	0.00000015 - 0.00000023	1.10E-05	NS	3.82E-05 C	N/A	N/A	NO	BSL
	51207-31-9	2,3,7,8-Tetrachlorodibenzofuran	1.70E-06 Q	9.60E-06 J	MG/KG	SJS05-SS66-00-03D	4/4	0.00000035 - 0.00000078	9.60E-06	NS	1.91E-04 C	N/A	N/A	NO	BSL
	3268-87-9	Octachlorodibenzo-p-dioxin	3.80E-04	2.40E-03	MG/KG	SJS05-SS50-00-03D-P	4/4	0.00000025 - 0.00000048	2.40E-03	NS	1.90E+00 C	N/A	N/A	NO	BSL
	39001-02-0	Octachlorodibenzofuran	1.10E-05	1.00E-04	MG/KG	SJS05-SS44-00-03D	4/4	0.00000018 - 0.0000003	1.00E-04	NS	1.90E+00 C	N/A	N/A	NO	BSL
	121-14-2	2,4-Dinitrotoluene	3.03E-01	6.38E-01	MG/KG	SJS05-SS14-000	2/26	0.2 - 0.54	6.38E-01	ND	2.04E+02 N	N/A	N/A	NO	BSL
	35572-78-2	2-Amino-4,6-dinitrotoluene	4.17E-01	4.17E-01	MG/KG	SJS05-SS24-000	1/26	0.2 - 0.54	4.17E-01	NA	2.00E+01	N/A	N/A	NO	BSL
	7429-90-5	Aluminum	9.00E+02	2.22E+04	MG/KG	SJS05-SS49-00-03D	66/66	5.8 - 92	2.22E+04	2.28E+04	1.02E+05 N	N/A	N/A	NO	BSL
	7440-36-0	Antimony	5.10E-01 L	5.65E+01 L	MG/KG	SJS05-SS44-00-03D	25/51	0.31 - 28	5.65E+01	1.00E+00	4.09E+01 N	N/A	N/A	YES	ASL
	7440-38-2	Arsenic	8.80E-01 J	1.52E+02	MG/KG	SJS05-SS11-000	66/66	0.3 - 4.6	1.52E+02	2.40E+01	1.91E+00 C	N/A	N/A	YES	ASL
	7440-39-3	Barium	9.10E+00 J	2.39E+04	MG/KG	SJS05-SS36-000	66/66	2.99E-02 - 92	2.39E+04	9.80E+01	7.15E+03 N	N/A	N/A	YES	ASL
	7440-41-7	Beryllium	6.10E-02 J	1.30E+00 J	MG/KG	JS05-SS18-000 SJS05-SS24-00	66/66	1.99E-02 - 2.3	1.30E+00	1.00E+00	2.04E+02 N	N/A	N/A	NO	BSL
	7440-43-9	Cadmium	6.00E-02 J	4.78E+01 J	MG/KG	SJS05-SS38-000	47/66	5.0E-02 - 2.3	4.78E+01	ND	1.02E+02 N	N/A	N/A	NO	BSL
	7440-70-2	Calcium	2.30E+02 J	1.65E+05 J	MG/KG	SJS05-SS51-00-03D	66/66	8.80 - 5500	1.65E+05	3.25E+03	N/A	N/A	N/A	NO	NUT
	7440-47-3	Chromium	2.50E+00	8.67E+02	MG/KG	SJS05-SS19-000	66/66	0.17 - 4.6	8.67E+02	4.50E+01	3.07E+02 N	N/A	N/A	YES	ASL
	7440-48-4	Cobalt	3.90E-01 J	1.77E+01	MG/KG	SJS05-SS01-000	64/66	7.99E-02 - 23	1.77E+01	1.30E+01	2.04E+03 N	N/A	N/A	NO	BSL

Table 2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 5

St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
	7440-50-8	Copper	4.20E+00 J	2.09E+05 J	MG/KG	SJS05-SS44-00-03D	66/66	0.17 - 320	2.09E+05	5.80E+01	4.09E+03 N	N/A	N/A	YES	ASL
	57-12-5	Cyanide	2.10E-01 J	5.20E+00	MG/KG	SJS05-SS51-00-03D	18/59	0.17 - 1.1	5.20E+00	ND	2.04E+03 N	N/A	N/A	NO	BSL
	7439-89-6	Iron	1.73E+03	1.20E+05	MG/KG	SJS05-SS01-000	66/66	2.66 - 46	1.20E+05	6.13E+04	3.07E+04 N	N/A	N/A	YES	ASL
	7439-92-1	Lead	1.04E+01	7.21E+03 J	MG/KG	SJS05-SS01-000	66/66	0.15 - 1.4	7.21E+03	1.47E+02	4.00E+02	N/A	N/A	YES	ASL
	7439-95-4	Magnesium	2.37E+02 J	9.82E+03	MG/KG	SJS05-SS36-000	66/66	3.7 - 2300	9.82E+03	4.51E+03	N/A	N/A	N/A	NO	NUT
	7439-96-5	Manganese	1.60E+01 K	1.87E+03	MG/KG	SJS05-SS36-000	66/66	5.0E-02 - 6.9	1.87E+03	1.98E+02	2.04E+03 N	N/A	N/A	NO	BSL
	7439-97-6	Mercury	3.00E-02 J	1.10E+00	MG/KG	SJS05-SS33-000	58/65	9.9E-03 - 0.24	1.10E+00	1.00E+00	3.10E+01	N/A	N/A	NO	BSL
	7440-02-0	Nickel	1.50E+00 J	1.98E+02	MG/KG	SJS05-SS44-00-03D	65/66	0.140 - 18	1.98E+02	1.90E+01	2.04E+03 N	N/A	N/A	NO	BSL
	7440-09-7	Potassium	2.23E+02 J	4.43E+03	MG/KG	SJS05-SS35-000	60/66	2 - 2300	4.43E+03	4.58E+03	N/A	N/A	N/A	NO	NUT
	7782-49-2	Selenium	4.90E-01 J	6.10E+00 L	MG/KG	SJS05-SS44-00-03D	13/66	0.4 - 2.3	6.10E+00	2.00E+00	5.11E+02 N	N/A	N/A	NO	BSL
	7440-22-4	Silver	3.10E-01 J	2.34E+01	MG/KG	SJS05-SS66-00-03D	33/66	0.14 - 4.6	2.34E+01	7.00E-01	5.11E+02 N	N/A	N/A	NO	BSL
	7440-23-5	Sodium	5.86E+01 J	6.41E+03	MG/KG	SJS05-SS18-000	38/66	9.07 - 2300	6.41E+03	6.20E+02	N/A	N/A	N/A	NO	NUT
	7440-28-0	Thallium	4.50E-01 J	7.70E+00	MG/KG	SJS05-SS44-00-03D	19/66	0.31 - 4.6	7.70E+00	ND	7.15E+00 N	N/A	N/A	YES	ASL
	7440-62-2	Vanadium	5.00E+00 J	6.91E+01	MG/KG	SJS05-SS35-000	66/66	9.0E-02 - 23	6.91E+01	1.43E+03	1.00E+02 N	N/A	N/A	NO	BSL
	7440-66-6	Zinc	2.00E+01	1.24E+05	MG/KG	SJS05-SS44-00-03D	66/66	0.28 - 260	1.24E+05	6.13E+04	3.07E+04 N	N/A	N/A	YES	ASL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Dredge Fill Background Upper Tolerance Limit (UTL) from CH2M Hill Final Background Investigation Report. St. Juliens Creek Annex, Chesapeake, Virginia. October 2001.

[4] Risk-Based Concentration Table for Industrial Soil, April 14, 2004, U.S. EPA Region III, Jennifer Hubbard.
RBC values for dioxin congeners calculated by adjusting 2,3,7,8-TCDD RBC with appropriate factors from WHO, 1998.
RBC value for trichloroethene is calculated using 1997 NCEA toxicity numbers, and equations in RBC Table.
RBC value for pyrene used as surrogate for phenanthrene and benzo(g,h,i)perylene.
RBC value for endosulfan used as surrogate for endosulfan I, endosulfan II, and endosulfan sulfate.
RBC value for endrin used as surrogate for endrin aldehyde and endrin ketone.
RBC value for chromium VI used for total chromium.
Lead screening toxicity value is 400 mg/kg, the EPA residential soil screening level for lead.
RBC value for manganese-nonfood used as surrogate for manganese.
RBC value for mercuric chloride used as surrogate for mercury.

[5] RBC value for napthalene used as surrogate for acenaphthylene.
Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic
ND - Compounds were analyzed but not detected during Background Investigation
NS- Compounds were not sampled for during Background Investigation

Table 2.3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 5

St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
At Site 5	540-59-0	1,2-Dichloroethene (total)	1.00E-03 J	1.00E-03 J	MG/KG	SJS05-SS08-000	1/34	0.01 - 0.022	1.00E-03	ND	7.04E+01 N	N/A	N/A	NO	BSL
	78-93-3	2-Butanone	2.80E-02	2.10E-01	MG/KG	SJS05-SS06-000	2/34	0.01 - 0.022	2.10E-01	ND	4.69E+03 N	N/A	N/A	NO	BSL
	67-64-1	Acetone	9.00E-03 J	6.20E-02	MG/KG	SJS05-SS14-000	11/34	0.01 - 0.022	6.20E-02	ND	7.04E+03 N	N/A	N/A	NO	BSL
	67-66-3	Chloroform	2.00E-03 J	2.00E-03 J	MG/KG	SJS05-SS26-000	1/34	0.01 - 0.022	2.00E-03	NS	7.82E+01 N	N/A	N/A	NO	BSL
	74-87-3	Chloromethane	3.00E-03 J	5.00E-03 J	MG/KG	SJS05-SS26-000	2/34	0.01 - 0.022	5.00E-03	NS	N/A	N/A	N/A	NO	NTX
	75-09-2	Methylene chloride	2.00E-03 J	1.71E-01	MG/KG	SJS05-SS12-000	10/34	0.01 - 0.022	1.71E-01	ND	8.52E+01 C	N/A	N/A	NO	BSL
	100-42-5	Styrene	2.90E-02	2.90E-02	MG/KG	SJS05-SS34-000	1/34	0.01 - 0.022	2.90E-02	ND	1.56E+03 N	N/A	N/A	NO	BSL
	127-18-4	Tetrachloroethene	1.00E-03 J	4.00E-03 J	MG/KG	SJS05-SS09-000	3/34	0.01 - 0.022	4.00E-03	ND	1.18E+00 C	N/A	N/A	NO	BSL
	108-88-3	Toluene	2.00E-03 J	5.00E-03 J	MG/KG	SJS05-SS09-000	5/34	0.01 - 0.022	5.00E-03	ND	1.56E+03 N	N/A	N/A	NO	BSL
	79-01-6	Trichloroethene	2.00E-03 J	5.80E-02	MG/KG	SJS05-SS27-000	10/34	0.01 - 0.022	5.80E-02	ND	4.69E+01 C	N/A	N/A	NO	BSL
	1330-20-7	Xylene, total	2.00E-03 J	3.00E-03 J	MG/KG	SJS05-SS05-000	2/34	0.01 - 0.022	3.00E-03	ND	1.56E+03 N	N/A	N/A	NO	BSL
	121-14-2	2,4-Dinitrotoluene	4.30E-02 J	3.20E+00 J	MG/KG	SJS05-SS03-000	8/38	0.33 - 2	3.20E+00	ND	1.56E+01 N	N/A	N/A	NO	BSL
	606-20-2	2,6-Dinitrotoluene	3.90E-02 J	3.90E-02 J	MG/KG	SJS05-SS01-000	1/38	0.33 - 2	3.90E-02	ND	7.82E+00 N	N/A	N/A	NO	BSL
	91-57-6	2-Methylnaphthalene	4.20E-02 J	5.70E-02 J	MG/KG	SJS05-SS45-00-03D	2/66	0.33 - 2	5.70E-02	ND	3.10E+01 N	N/A	N/A	NO	BSL
	100-01-6	4-Nitroaniline	4.60E-01 J	4.60E-01 J	MG/KG	SJS05-SS37P-000	1/38	0.83 - 5	4.60E-01	NS	3.19E+01 C	N/A	N/A	NO	BSL
	83-32-9	Acenaphthene	4.10E-02 J	4.10E-02 J	MG/KG	SJS05-SS04-000	1/66	0.33 - 2	4.10E-02	6.00E-01	4.69E+02 N	N/A	N/A	NO	BSL
	208-96-8	Acenaphthylene	1.80E-02 J	5.40E-01	MG/KG	S05-SS41-00-03D SJS05-SS20-(	17/66	0.33 - 2	5.40E-01	2.00E-01	1.56E+02 N	N/A	N/A	NO	BSL
	120-12-7	Anthracene	1.80E-02 J	4.50E-01 J	MG/KG	SJS05-SS41-00-03D	17/66	0.33 - 2	4.50E-01	5.00E-01	2.35E+03 N	N/A	N/A	NO	BSL
	56-55-3	Benzo(a)anthracene	2.70E-02 J	1.50E+00	MG/KG	SJS05-SS41-00-03D	50/66	0.33 - 2	1.50E+00	2.00E+00	8.75E-01 C	N/A	N/A	YES	ASL
	50-32-8	Benzo(a)pyrene	3.50E-02 J	1.20E+00 J	MG/KG	SJS05-SS26-000	47/66	0.33 - 2	1.20E+00	2.00E+00	8.75E-02 C	N/A	N/A	YES	ASL
	205-99-2	Benzo(b)fluoranthene	3.10E-02 J	2.70E+00	MG/KG	SJS05-SS41-00-03D	54/66	0.33 - 2	2.70E+00	3.00E+00	8.75E-01 C	N/A	N/A	YES	ASL
	191-24-2	Benzo(g,h,i)perylene	5.20E-02 J	2.30E+00	MG/KG	SJS05-SS66-00-03D	42/66	0.33 - 2	2.30E+00	2.00E+00	2.35E+02 N	N/A	N/A	NO	BSL
	207-08-9	Benzo(k)fluoranthene	2.70E-02 J	8.20E-01	MG/KG	SJS05-SS41-00-03D	45/66	0.33 - 2	8.20E-01	2.00E+00	8.75E+00 C	N/A	N/A	NO	BSL
	86-74-8	Carbazole	1.40E-02 J	6.90E-02 J	MG/KG	SJS05-SS26-000	4/38	0.33 - 2	6.90E-02	ND	3.19E+01 C	N/A	N/A	NO	BSL
	218-01-9	Chrysene	3.30E-02 J	2.20E+00	MG/KG	SJS05-SS41-00-03D	53/66	0.33 - 2	2.20E+00	3.00E+00	8.75E+01 C	N/A	N/A	NO	BSL
	84-74-2	Di-n-butylphthalate	2.10E-02 J	4.70E+00	MG/KG	SJS05-SS03-000	14/38	0.33 - 2	4.70E+00	ND	7.82E+02 N	N/A	N/A	NO	BSL
	53-70-3	Dibenz(a,h)anthracene	3.80E-02 J	5.60E-01 J	MG/KG	SJS05-SS66-00-03D	16/66	0.33 - 2	5.60E-01	7.00E-01	8.75E-02 C	N/A	N/A	YES	ASL
	84-66-2	Diethylphthalate	1.70E-01 J	1.70E-01 J	MG/KG	SJS05-SS12-000	1/38	0.33 - 2	1.70E-01	ND	6.26E+03 N	N/A	N/A	NO	BSL
	131-11-3	Dimethyl phthalate	6.30E-02 J	6.30E-02 J	MG/KG	SJS05-SS12-000	1/38	0.33 - 2	6.30E-02	ND	7.82E+04 N	N/A	N/A	NO	BSL
	206-44-0	Fluoranthene	4.90E-02 J	2.00E+00 J	MG/KG	SJS05-SS03-000	52/66	0.33 - 2	2.00E+00	3.00E+00	3.13E+02 N	N/A	N/A	NO	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	2.80E-02 J	1.60E+00	MG/KG	SJS05-SS66-00-03D	46/66	0.33 - 2	1.60E+00	2.00E+00	8.75E-01 C	N/A	N/A	YES	ASL
	91-20-3	Naphthalene	1.20E-02 J	9.00E-02 J	MG/KG	SJS05-SS35-000	6/66	0.33 - 2	9.00E-02	5.00E-01	1.56E+02 N	N/A	N/A	NO	BSL
	85-01-8	Phenanthrene	2.50E-02 J	3.90E-01 J	MG/KG	SJS05-SS41-00-03D	38/66	0.33 - 2	3.90E-01	9.00E-01	2.35E+02 N	N/A	N/A	NO	BSL
	129-00-0	Pyrene	4.30E-02 J	1.30E+00 J	MG/KG	SJS05-SS26-000	53/66	0.33 - 2	1.30E+00	3.00E+00	2.35E+02 N	N/A	N/A	NO	BSL
	117-81-7	bis(2-Ethylhexyl)phthalate	6.60E-02 J	1.80E-01 J	MG/KG	SJS05-SS12-000	4/38	0.28 - 2	1.80E-01	ND	4.56E+01 C	N/A	N/A	NO	BSL
	86-30-6	n-Nitrosodiphenylamine	1.20E-01 J	5.30E-01 UJ	MG/KG	SJS05-SS03-000 SJS05-SS21-00	3/38	0.33 - 2	5.30E-01	ND	1.30E+02 C	N/A	N/A	NO	BSL

Table 2.3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 5

St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
	72-54-8	4,4'-DDD	4.60E-04 J	3.10E-01 J	MG/KG	SJS05-SS09-000	43/61	3.29E-03 - 0.057	3.10E-01	5.00E-03	2.66E+00 C	N/A	N/A	NO	BSL
	72-55-9	4,4'-DDE	5.30E-04 J	4.70E+00 J	MG/KG	SJS05-SS35-000	59/62	3.29E-03 - 0.6	4.70E+00	9.00E-03	1.88E+00 C	N/A	N/A	YES	ASL
	50-29-3	4,4'-DDT	2.20E-03 J	3.10E+00 J	MG/KG	SJS05-SS32-000 SJS05-SS35-00	56/62	3.29E-03 - 0.6	3.10E+00	2.00E-02	1.88E+00 C	N/A	N/A	YES	ASL
	11096-82-5	Aroclor-1260	3.00E-02 J	3.90E-02 UJ	MG/KG	SJS05-SS08-000 SJS05-SS33-00	2/34	0.033 - 0.37	3.90E-02	ND	3.19E-01 C	N/A	N/A	NO	BSL
	60-57-1	Dieldrin	1.30E-03 J	6.80E-03	MG/KG	SJS05-SS08-000	3/62	3.29E-03 - 0.057	6.80E-03	5.00E-03	3.99E-02 C	N/A	N/A	NO	BSL
	1031-07-8	Endosulfan sulfate	5.40E-03 J	1.10E-02 J	MG/KG	SJS05-SS53-00-03D	4/62	3.29E-03 - 0.057	1.10E-02	NS	4.69E+01 N	N/A	N/A	NO	BSL
	53494-70-5	Endrin ketone	5.60E-03 J	2.00E-02	MG/KG	SJS05-SS53-00-03D	3/62	3.29E-03 - 0.057	2.00E-02	NS	2.35E+00 N	N/A	N/A	NO	BSL
	319-84-6	alpha-BHC	3.50E-03	3.50E-03 UJ	MG/KG	SJS05-SS08-000 SJS05-SS23-00	1/62	0.0017 - 0.029	3.50E-03	ND	1.01E-01 C	N/A	N/A	NO	BSL
	5103-71-9	alpha-Chlordane	5.80E-04 J	2.40E-03 J	MG/KG	SJS05-SS08-000	3/62	0.0017 - 0.029	2.40E-03	3.00E-03	1.82E+00 C	N/A	N/A	NO	BSL
	5103-74-2	gamma-Chlordane	2.60E-03 J	2.60E-03 J	MG/KG	SJS05-SS08-000	1/62	0.0017 - 0.029	2.60E-03	3.00E-03	1.82E+00 C	N/A	N/A	NO	BSL
	35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	5.60E-05	1.80E-04	MG/KG	SJS05-SS50-00-03D-P	4/4	0.00000036 - 0.00000039	1.80E-04	NS	4.26E-04 C	N/A	N/A	NO	BSL
	67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.00E-05	8.40E-05	MG/KG	SJS05-SS44-00-03D	4/4	0.00000014 - 0.00000031	8.40E-05	NS	4.26E-04 C	N/A	N/A	NO	BSL
	55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.80E-06 J	7.70E-06	MG/KG	SJS05-SS44-00-03D	2/4	0.00000019 - 0.00000033	7.70E-06	NS	4.26E-04 C	N/A	N/A	NO	BSL
	39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	1.60E-06 Q	5.90E-06 J	MG/KG	SJS05-SS50-00-03D-P	4/4	0.00000015 - 0.00000037	5.90E-06	NS	4.26E-05 C	N/A	N/A	NO	BSL
	70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran	3.10E-06 J	3.50E-05	MG/KG	SJS05-SS44-00-03D	4/4	0.00000011 - 0.00000026	3.50E-05	NS	4.26E-05 C	N/A	N/A	NO	BSL
	57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	3.60E-06 J	9.10E-06	MG/KG	SJS05-SS50-00-03D-P	4/4	0.00000017 - 0.00000041	9.10E-06	NS	4.26E-05 C	N/A	N/A	NO	BSL
	57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran	1.60E-06 J	1.30E-05	MG/KG	SJS05-SS44-00-03D	4/4	0.00000012 - 0.00000026	1.30E-05	NS	4.26E-05 C	N/A	N/A	NO	BSL
	19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	5.30E-06 J	1.70E-05	MG/KG	SJS05-SS50-00-03D-P	4/4	0.00000015 - 0.00000037	1.70E-05	NS	1.03E-04 C	N/A	N/A	NO	BSL
	72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran	9.00E-07 J	9.00E-07 J	MG/KG	SJS05-SS44-00-03D	1/4	0.00000014 - 0.00000024	9.00E-07	NS	4.26E-05 C	N/A	N/A	NO	BSL
	40321-76-4	1,2,3,7,8-Pentachlorodibenzo-p-dioxin	1.30E-06 J	4.40E-06 J	MG/KG	SJS05-SS50-00-03D-P	4/4	0.00000019 - 0.00000041	4.40E-06	NS	4.26E-06 C	N/A	N/A	YES	ASL
	57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran	1.60E-06 J	7.30E-06	MG/KG	SJS05-SS44-00-03D	4/4	0.0000002 - 0.00000042	7.30E-06	NS	8.52E-05 C	N/A	N/A	NO	BSL
	60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran	1.40E-06 Q	1.90E-05	MG/KG	SJS05-SS44-00-03D	4/4	0.00000012 - 0.00000017	1.90E-05	NS	4.26E-05 C	N/A	N/A	NO	BSL
	57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran	2.00E-06 J	1.10E-05	MG/KG	SJS05-SS44-00-03D	4/4	0.00000015 - 0.00000023	1.10E-05	NS	8.52E-06 C	N/A	N/A	YES	ASL
	51207-31-9	2,3,7,8-Tetrachlorodibenzofuran	1.70E-06 Q	9.60E-06 J	MG/KG	SJS05-SS66-00-03D	4/4	0.00000035 - 0.00000078	9.60E-06	NS	4.26E-05 C	N/A	N/A	NO	BSL
	3268-87-9	Octachlorodibenzo-p-dioxin	3.80E-04	2.40E-03	MG/KG	SJS05-SS50-00-03D-P	4/4	0.00000025 - 0.00000048	2.40E-03	NS	4.30E-01 C	N/A	N/A	NO	BSL
	39001-02-0	Octachlorodibenzofuran	1.10E-05	1.00E-04	MG/KG	SJS05-SS44-00-03D	4/4	0.00000018 - 0.0000003	1.00E-04	NS	4.30E-01 C	N/A	N/A	NO	BSL
	121-14-2	2,4-Dinitrotoluene	3.03E-01	6.38E-01	MG/KG	SJS05-SS14-000	2/26	0.2 - 0.54	6.38E-01	ND	1.56E+01 N	N/A	N/A	NO	BSL
	35572-78-2	2-Amino-4,6-dinitrotoluene	4.17E-01	4.17E-01	MG/KG	SJS05-SS24-000	1/26	0.2 - 0.54	4.17E-01	NA	1.60E+00	N/A	N/A	NO	BSL
	7429-90-5	Aluminum	9.00E+02	2.22E+04	MG/KG	SJS05-SS49-00-03D	66/66	5.8 - 92	2.22E+04	2.28E+04	7.82E+03 N	N/A	N/A	YES	ASL
	7440-36-0	Antimony	5.10E-01 L	5.65E+01 L	MG/KG	SJS05-SS44-00-03D	25/51	0.31 - 28	5.65E+01	1.00E+00	3.13E+00 N	N/A	N/A	YES	ASL
	7440-38-2	Arsenic	8.80E-01 J	1.52E+02	MG/KG	SJS05-SS11-000	66/66	0.3 - 4.6	1.52E+02	2.40E+01	4.26E-01 C	N/A	N/A	YES	ASL
	7440-39-3	Barium	9.10E+00 J	2.39E+04	MG/KG	SJS05-SS36-000	66/66	2.99E-02 - 92	2.39E+04	9.80E+01	5.48E+02 N	N/A	N/A	YES	ASL
	7440-41-7	Beryllium	6.10E-02 J	1.30E+00 J	MG/KG	SJS05-SS18-000 SJS05-SS24-00	66/66	1.99E-02 - 2.3	1.30E+00	1.00E+00	1.56E+01 N	N/A	N/A	NO	BSL
	7440-43-9	Cadmium	6.00E-02 J	4.78E+01 J	MG/KG	SJS05-SS38-000	47/66	5.0E-02 - 2.3	4.78E+01	ND	7.82E+00 N	N/A	N/A	YES	ASL
	7440-70-2	Calcium	2.30E+02 J	1.65E+05 J	MG/KG	SJS05-SS51-00-03D	66/66	8.80 - 5500	1.65E+05	3.25E+03	N/A	N/A	N/A	NO	NUT
	7440-47-3	Chromium	2.50E+00	8.67E+02	MG/KG	SJS05-SS19-000	66/66	0.17 - 4.6	8.67E+02	4.50E+01	2.35E+01 N	N/A	N/A	YES	ASL
	7440-48-4	Cobalt	3.90E-01 J	1.77E+01	MG/KG	SJS05-SS01-000	64/66	7.99E-02 - 23	1.77E+01	1.30E+01	1.56E+02 N	N/A	N/A	NO	BSL

Table 2.3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 5

St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
	7440-50-8	Copper	4.20E+00 J	2.09E+05 J	MG/KG	SJS05-SS44-00-03D	66/66	0.17 - 320	2.09E+05	5.80E+01	3.13E+02 N	N/A	N/A	YES	ASL
	57-12-5	Cyanide	2.10E-01 J	5.20E+00	MG/KG	SJS05-SS51-00-03D	18/59	0.17 - 1.1	5.20E+00	ND	1.56E+02 N	N/A	N/A	NO	BSL
	7439-89-6	Iron	1.73E+03	1.20E+05	MG/KG	SJS05-SS01-000	66/66	2.66 - 46	1.20E+05	6.13E+04	2.35E+03 N	N/A	N/A	YES	ASL
	7439-92-1	Lead	1.04E+01	7.21E+03 J	MG/KG	SJS05-SS01-000	66/66	0.15 - 1.4	7.21E+03	1.47E+02	4.00E+02	N/A	N/A	YES	ASL
	7439-95-4	Magnesium	2.37E+02 J	9.82E+03	MG/KG	SJS05-SS36-000	66/66	3.7 - 2300	9.82E+03	4.51E+03	N/A	N/A	N/A	NO	NUT
	7439-96-5	Manganese	1.60E+01 K	1.87E+03	MG/KG	SJS05-SS36-000	66/66	5.0E-02 - 6.9	1.87E+03	1.98E+02	1.56E+02 N	N/A	N/A	YES	ASL
	7439-97-6	Mercury	3.00E-02 J	1.10E+00	MG/KG	SJS05-SS33-000	58/65	9.9E-03 - 0.24	1.10E+00	1.00E+00	2.30E+00 N	N/A	N/A	NO	BSL
	7440-02-0	Nickel	1.50E+00 J	1.98E+02	MG/KG	SJS05-SS44-00-03D	65/66	0.140 - 18	1.98E+02	1.90E+01	1.56E+02 N	N/A	N/A	YES	ASL
	7440-09-7	Potassium	2.23E+02 J	4.43E+03	MG/KG	SJS05-SS35-000	60/66	2 - 2300	4.43E+03	4.58E+03	N/A	N/A	N/A	NO	NUT
	7782-49-2	Selenium	4.90E-01 J	6.10E+00 L	MG/KG	SJS05-SS44-00-03D	13/66	0.4 - 2.3	6.10E+00	2.00E+00	3.91E+01 N	N/A	N/A	NO	BSL
	7440-22-4	Silver	3.10E-01 J	2.34E+01	MG/KG	SJS05-SS66-00-03D	33/66	0.14 - 4.6	2.34E+01	7.00E-01	3.91E+01 N	N/A	N/A	NO	BSL
	7440-23-5	Sodium	5.86E+01 J	6.41E+03	MG/KG	SJS05-SS18-000	38/66	9.07 - 2300	6.41E+03	6.20E+02	N/A	N/A	N/A	NO	NUT
	7440-28-0	Thallium	4.50E-01 J	7.70E+00	MG/KG	SJS05-SS44-00-03D	19/66	0.31 - 4.6	7.70E+00	ND	5.48E-01 N	N/A	N/A	YES	ASL
	7440-62-2	Vanadium	5.00E+00 J	6.91E+01	MG/KG	SJS05-SS35-000	66/66	9.0E-02 - 23	6.91E+01	1.43E+03	7.80E+00 N	N/A	N/A	YES	ASL
	7440-66-6	Zinc	2.00E+01	1.24E+05	MG/KG	SJS05-SS44-00-03D	66/66	0.28 - 260	1.24E+05	6.13E+04	2.35E+03 N	N/A	N/A	YES	ASL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Dredge Fill Background Upper Tolerance Limit (UTL) from CH2M Hill Final Background Investigation Report. St. Juliens Creek Annex, Chesapeake, Virginia. October 2001.

[4] Risk-Based Concentration Table for Residential Soil, April 14, 2004, U.S. EPA Region III, Jennifer Hubbard.
RBC values for dioxin congeners calculated by adjusting 2,3,7,8-TCDD RBC with appropriate factors from WHO, 1998.
RBC value for trichloroethene is calculated using 1997 NCEA toxicity numbers, and equations in RBC Table.
RBC value for pyrene used as surrogate for phenanthrene and benzo(g,h,i)perylene.
RBC value for endosulfan used as surrogate for endosulfan I, endosulfan II, and endosulfan sulfate.
RBC value for endrin used as surrogate for endrin aldehyde and endrin ketone.
RBC value for chromium VI used for total chromium.
Lead screening toxicity value is 400 mg/kg, the EPA residential soil screening level for lead.
RBC value for manganese-nonfood used as surrogate for manganese.
RBC value for mercuric chloride used as surrogate for mercury.

[5] RBC value for napthalene used as surrogate for acenaphthylene.
Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic
ND - Compounds were analyzed but not detected during Background Investigation
NS- Compounds were not sampled for during Background Investigation

Table 2.4

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 5

St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
At Site 5	540-59-0	1,2-Dichloroethene (total)	1.00E-03 J	1.00E-03 J	MG/KG	SJS05-SS08-000	1/34	0.01 - 0.022	1.00E-03	ND	7.04E+01 N	N/A	N/A	NO	BSL
	78-93-3	2-Butanone	2.80E-02	2.10E-01	MG/KG	SJS05-SS06-000	2/34	0.01 - 0.022	2.10E-01	ND	4.69E+03 N	N/A	N/A	NO	BSL
	67-64-1	Acetone	9.00E-03 J	6.20E-02	MG/KG	SJS05-SS14-000	11/34	0.01 - 0.022	6.20E-02	ND	7.04E+03 N	N/A	N/A	NO	BSL
	67-66-3	Chloroform	2.00E-03 J	2.00E-03 J	MG/KG	SJS05-SS26-000	1/34	0.01 - 0.022	2.00E-03	NS	7.82E+01 N	N/A	N/A	NO	BSL
	74-87-3	Chloromethane	3.00E-03 J	5.00E-03 J	MG/KG	SJS05-SS26-000	2/34	0.01 - 0.022	5.00E-03	NS	N/A	N/A	N/A	NO	NTX
	75-09-2	Methylene chloride	2.00E-03 J	1.71E-01	MG/KG	SJS05-SS12-000	10/34	0.01 - 0.022	1.71E-01	ND	8.52E+01 C	N/A	N/A	NO	BSL
	100-42-5	Styrene	2.90E-02	2.90E-02	MG/KG	SJS05-SS34-000	1/34	0.01 - 0.022	2.90E-02	ND	1.56E+03 N	N/A	N/A	NO	BSL
	127-18-4	Tetrachloroethene	1.00E-03 J	4.00E-03 J	MG/KG	SJS05-SS09-000	3/34	0.01 - 0.022	4.00E-03	ND	1.18E+00 C	N/A	N/A	NO	BSL
	108-88-3	Toluene	2.00E-03 J	5.00E-03 J	MG/KG	SJS05-SS09-000	5/34	0.01 - 0.022	5.00E-03	ND	1.56E+03 N	N/A	N/A	NO	BSL
	79-01-6	Trichloroethene	2.00E-03 J	5.80E-02	MG/KG	SJS05-SS27-000	10/34	0.01 - 0.022	5.80E-02	ND	4.69E+01 C	N/A	N/A	NO	BSL
	1330-20-7	Xylene, total	2.00E-03 J	3.00E-03 J	MG/KG	SJS05-SS05-000	2/34	0.01 - 0.022	3.00E-03	ND	1.56E+03 N	N/A	N/A	NO	BSL
	121-14-2	2,4-Dinitrotoluene	4.30E-02 J	3.20E+00 J	MG/KG	SJS05-SS03-000	8/38	0.33 - 2	3.20E+00	ND	1.56E+01 N	N/A	N/A	NO	BSL
	606-20-2	2,6-Dinitrotoluene	3.90E-02 J	3.90E-02 J	MG/KG	SJS05-SS01-000	1/38	0.33 - 2	3.90E-02	ND	7.82E+00 N	N/A	N/A	NO	BSL
	91-57-6	2-Methylnaphthalene	4.20E-02 J	5.70E-02 J	MG/KG	SJS05-SS45-00-03D	2/66	0.33 - 2	5.70E-02	ND	3.10E+01 N	N/A	N/A	NO	BSL
	100-01-6	4-Nitroaniline	4.60E-01 J	4.60E-01 J	MG/KG	SJS05-SS37P-000	1/38	0.83 - 5	4.60E-01	NS	3.19E+01 C	N/A	N/A	NO	BSL
	83-32-9	Acenaphthene	4.10E-02 J	4.10E-02 J	MG/KG	SJS05-SS04-000	1/66	0.33 - 2	4.10E-02	6.00E-01	4.69E+02 N	N/A	N/A	NO	BSL
	208-96-8	Acenaphthylene	1.80E-02 J	5.40E-01	MG/KG	JS05-SS41-00-03D SJS05-SS20-0	17/66	0.33 - 2	5.40E-01	2.00E-01	1.56E+02 N	N/A	N/A	NO	BSL
	120-12-7	Anthracene	1.80E-02 J	4.50E-01 J	MG/KG	SJS05-SS41-00-03D	17/66	0.33 - 2	4.50E-01	5.00E-01	2.35E+03 N	N/A	N/A	NO	BSL
	56-55-3	Benzo(a)anthracene	2.70E-02 J	1.50E+00	MG/KG	SJS05-SS41-00-03D	50/66	0.33 - 2	1.50E+00	2.00E+00	8.75E-01 C	N/A	N/A	YES	ASL
	50-32-8	Benzo(a)pyrene	3.50E-02 J	1.20E+00 J	MG/KG	SJS05-SS26-000	47/66	0.33 - 2	1.20E+00	2.00E+00	8.75E-02 C	N/A	N/A	YES	ASL
	205-99-2	Benzo(b)fluoranthene	3.10E-02 J	2.70E+00	MG/KG	SJS05-SS41-00-03D	54/66	0.33 - 2	2.70E+00	3.00E+00	8.75E-01 C	N/A	N/A	YES	ASL
	191-24-2	Benzo(g,h,i)perylene	5.20E-02 J	2.30E+00	MG/KG	SJS05-SS66-00-03D	42/66	0.33 - 2	2.30E+00	2.00E+00	2.35E+02 N	N/A	N/A	NO	BSL
	207-08-9	Benzo(k)fluoranthene	2.70E-02 J	8.20E-01	MG/KG	SJS05-SS41-00-03D	45/66	0.33 - 2	8.20E-01	2.00E+00	8.75E+00 C	N/A	N/A	NO	BSL
	86-74-8	Carbazole	1.40E-02 J	6.90E-02 J	MG/KG	SJS05-SS26-000	4/38	0.33 - 2	6.90E-02	ND	3.19E+01 C	N/A	N/A	NO	BSL
	218-01-9	Chrysene	3.30E-02 J	2.20E+00	MG/KG	SJS05-SS41-00-03D	53/66	0.33 - 2	2.20E+00	3.00E+00	8.75E+01 C	N/A	N/A	NO	BSL
	84-74-2	Di-n-butylphthalate	2.10E-02 J	4.70E+00	MG/KG	SJS05-SS03-000	14/38	0.33 - 2	4.70E+00	ND	7.82E+02 N	N/A	N/A	NO	BSL
	53-70-3	Dibenz(a,h)anthracene	3.80E-02 J	5.60E-01 J	MG/KG	SJS05-SS66-00-03D	16/66	0.33 - 2	5.60E-01	7.00E-01	8.75E-02 C	N/A	N/A	YES	ASL
	84-66-2	Diethylphthalate	1.70E-01 J	1.70E-01 J	MG/KG	SJS05-SS12-000	1/38	0.33 - 2	1.70E-01	ND	6.26E+03 N	N/A	N/A	NO	BSL
	131-11-3	Dimethyl phthalate	6.30E-02 J	6.30E-02 J	MG/KG	SJS05-SS12-000	1/38	0.33 - 2	6.30E-02	ND	7.82E+04 N	N/A	N/A	NO	BSL
	206-44-0	Fluoranthene	4.90E-02 J	2.00E+00 J	MG/KG	SJS05-SS03-000	52/66	0.33 - 2	2.00E+00	3.00E+00	3.13E+02 N	N/A	N/A	NO	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	2.80E-02 J	1.60E+00	MG/KG	SJS05-SS66-00-03D	46/66	0.33 - 2	1.60E+00	2.00E+00	8.75E-01 C	N/A	N/A	YES	ASL
	91-20-3	Naphthalene	1.20E-02 J	9.00E-02 J	MG/KG	SJS05-SS35-000	6/66	0.33 - 2	9.00E-02	5.00E-01	1.56E+02 N	N/A	N/A	NO	BSL
	85-01-8	Phenanthrene	2.50E-02 J	3.90E-01 J	MG/KG	SJS05-SS41-00-03D	38/66	0.33 - 2	3.90E-01	9.00E-01	2.35E+02 N	N/A	N/A	NO	BSL
	129-00-0	Pyrene	4.30E-02 J	1.30E+00 J	MG/KG	SJS05-SS26-000	53/66	0.33 - 2	1.30E+00	3.00E+00	2.35E+02 N	N/A	N/A	NO	BSL
	117-81-7	bis(2-Ethylhexyl)phthalate	6.60E-02 J	1.80E-01 J	MG/KG	SJS05-SS12-000	4/38	0.28 - 2	1.80E-01	ND	4.56E+01 C	N/A	N/A	NO	BSL
	86-30-6	n-Nitrosodiphenylamine	1.20E-01 J	5.30E-01 UJ	MG/KG	SJS05-SS03-000 SJS05-SS21-000	3/38	0.33 - 2	5.30E-01	ND	1.30E+02 C	N/A	N/A	NO	BSL

Table 2.4

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 5

St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
	72-54-8	4,4'-DDD	4.60E-04 J	3.10E-01 J	MG/KG	SJS05-SS09-000	43/61	3.29E-03 - 0.057	3.10E-01	5.00E-03	2.66E+00 C	N/A	N/A	NO	BSL
	72-55-9	4,4'-DDE	5.30E-04 J	4.70E+00 J	MG/KG	SJS05-SS35-000	59/62	3.29E-03 - 0.6	4.70E+00	9.00E-03	1.88E+00 C	N/A	N/A	YES	ASL
	50-29-3	4,4'-DDT	2.20E-03 J	3.10E+00 J	MG/KG	SJS05-SS32-000 SJS05-SS35-000	56/62	3.29E-03 - 0.6	3.10E+00	2.00E-02	1.88E+00 C	N/A	N/A	YES	ASL
	11096-82-5	Aroclor-1260	3.00E-02 J	3.90E-02 UJ	MG/KG	SJS05-SS08-000 SJS05-SS33-000	2/34	0.033 - 0.37	3.90E-02	ND	3.19E-01 C	N/A	N/A	NO	BSL
	60-57-1	Dieldrin	1.30E-03 J	6.80E-03	MG/KG	SJS05-SS08-000	3/62	3.29E-03 - 0.057	6.80E-03	5.00E-03	3.99E-02 C	N/A	N/A	NO	BSL
	1031-07-8	Endosulfan sulfate	5.40E-03 J	1.10E-02 J	MG/KG	SJS05-SS53-00-03D	4/62	3.29E-03 - 0.057	1.10E-02	NS	4.69E+01 N	N/A	N/A	NO	BSL
	53494-70-5	Endrin ketone	5.60E-03 J	2.00E-02	MG/KG	SJS05-SS53-00-03D	3/62	3.29E-03 - 0.057	2.00E-02	NS	2.35E+00 N	N/A	N/A	NO	BSL
	319-84-6	alpha-BHC	3.50E-03	3.50E-03 UJ	MG/KG	SJS05-SS08-000 SJS05-SS23-000	1/62	0.0017 - 0.029	3.50E-03	ND	1.01E-01 C	N/A	N/A	NO	BSL
	5103-71-9	alpha-Chlordane	5.80E-04 J	2.40E-03 J	MG/KG	SJS05-SS08-000	3/62	0.0017 - 0.029	2.40E-03	3.00E-03	1.82E+00 C	N/A	N/A	NO	BSL
	5103-74-2	gamma-Chlordane	2.60E-03 J	2.60E-03 J	MG/KG	SJS05-SS08-000	1/62	0.0017 - 0.029	2.60E-03	3.00E-03	1.82E+00 C	N/A	N/A	NO	BSL
	35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	5.60E-05	1.80E-04	MG/KG	SJS05-SS50-00-03D-P	4/4	0.00000036 - 0.00000039	1.80E-04	NS	4.26E-04 C	N/A	N/A	NO	BSL
	67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.00E-05	8.40E-05	MG/KG	SJS05-SS44-00-03D	4/4	0.00000014 - 0.00000031	8.40E-05	NS	4.26E-04 C	N/A	N/A	NO	BSL
	55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.80E-06 J	7.70E-06	MG/KG	SJS05-SS44-00-03D	2/4	0.00000019 - 0.00000033	7.70E-06	NS	4.26E-04 C	N/A	N/A	NO	BSL
	39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	1.60E-06 Q	5.90E-06 J	MG/KG	SJS05-SS50-00-03D-P	4/4	0.00000015 - 0.00000037	5.90E-06	NS	4.26E-05 C	N/A	N/A	NO	BSL
	70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran	3.10E-06 J	3.50E-05	MG/KG	SJS05-SS44-00-03D	4/4	0.00000011 - 0.00000026	3.50E-05	NS	4.26E-05 C	N/A	N/A	NO	BSL
	57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	3.60E-06 J	9.10E-06	MG/KG	SJS05-SS50-00-03D-P	4/4	0.00000017 - 0.00000041	9.10E-06	NS	4.26E-05 C	N/A	N/A	NO	BSL
	57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran	1.60E-06 J	1.30E-05	MG/KG	SJS05-SS44-00-03D	4/4	0.00000012 - 0.00000026	1.30E-05	NS	4.26E-05 C	N/A	N/A	NO	BSL
	19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	5.30E-06 J	1.70E-05	MG/KG	SJS05-SS50-00-03D-P	4/4	0.00000015 - 0.00000037	1.70E-05	NS	1.03E-04 C	N/A	N/A	NO	BSL
	72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran	9.00E-07 J	9.00E-07 J	MG/KG	SJS05-SS44-00-03D	1/4	0.00000014 - 0.00000024	9.00E-07	NS	4.26E-05 C	N/A	N/A	NO	BSL
	40321-76-4	1,2,3,7,8-Pentachlorodibenzo-p-dioxin	1.30E-06 J	4.40E-06 J	MG/KG	SJS05-SS50-00-03D-P	4/4	0.00000019 - 0.00000041	4.40E-06	NS	4.26E-06 C	N/A	N/A	YES	ASL
	57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran	1.60E-06 J	7.30E-06	MG/KG	SJS05-SS44-00-03D	4/4	0.0000002 - 0.00000042	7.30E-06	NS	8.52E-05 C	N/A	N/A	NO	BSL
	60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran	1.40E-06 Q	1.90E-05	MG/KG	SJS05-SS44-00-03D	4/4	0.00000012 - 0.00000017	1.90E-05	NS	4.26E-05 C	N/A	N/A	NO	BSL
	57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran	2.00E-06 J	1.10E-05	MG/KG	SJS05-SS44-00-03D	4/4	0.00000015 - 0.00000023	1.10E-05	NS	8.52E-06 C	N/A	N/A	YES	ASL
	51207-31-9	2,3,7,8-Tetrachlorodibenzofuran	1.70E-06 Q	9.60E-06 J	MG/KG	SJS05-SS66-00-03D	4/4	0.00000035 - 0.00000078	9.60E-06	NS	4.26E-05 C	N/A	N/A	NO	BSL
	3268-87-9	Octachlorodibenzo-p-dioxin	3.80E-04	2.40E-03	MG/KG	SJS05-SS50-00-03D-P	4/4	0.00000025 - 0.00000048	2.40E-03	NS	4.30E-01 C	N/A	N/A	NO	BSL
	39001-02-0	Octachlorodibenzofuran	1.10E-05	1.00E-04	MG/KG	SJS05-SS44-00-03D	4/4	0.00000018 - 0.0000003	1.00E-04	NS	4.30E-01 C	N/A	N/A	NO	BSL
	121-14-2	2,4-Dinitrotoluene	3.03E-01	6.38E-01	MG/KG	SJS05-SS14-000	2/26	0.2 - 0.54	6.38E-01	ND	1.56E+01 N	N/A	N/A	NO	BSL
	35572-78-2	2-Amino-4,6-dinitrotoluene	4.17E-01	4.17E-01	MG/KG	SJS05-SS24-000	1/26	0.2 - 0.54	4.17E-01	NA	1.60E+00	N/A	N/A	NO	BSL
	7429-90-5	Aluminum	9.00E+02	2.22E+04	MG/KG	SJS05-SS49-00-03D	66/66	5.8 - 92	2.22E+04	2.28E+04	7.82E+03 N	N/A	N/A	YES	ASL
	7440-36-0	Antimony	5.10E-01 L	5.65E+01 L	MG/KG	SJS05-SS44-00-03D	25/51	0.31 - 28	5.65E+01	1.00E+00	3.13E+00 N	N/A	N/A	YES	ASL
	7440-38-2	Arsenic	8.80E-01 J	1.52E+02	MG/KG	SJS05-SS11-000	66/66	0.3 - 4.6	1.52E+02	2.40E+01	4.26E-01 C	N/A	N/A	YES	ASL
	7440-39-3	Barium	9.10E+00 J	2.39E+04	MG/KG	SJS05-SS36-000	66/66	2.99E-02 - 92	2.39E+04	9.80E+01	5.48E+02 N	N/A	N/A	YES	ASL
	7440-41-7	Beryllium	6.10E-02 J	1.30E+00 J	MG/KG	SJS05-SS18-000 SJS05-SS24-000	66/66	1.99E-02 - 2.3	1.30E+00	1.00E+00	1.56E+01 N	N/A	N/A	NO	BSL
	7440-43-9	Cadmium	6.00E-02 J	4.78E+01 J	MG/KG	SJS05-SS38-000	47/66	5.0E-02 - 2.3	4.78E+01	ND	7.82E+00 N	N/A	N/A	YES	ASL
	7440-70-2	Calcium	2.30E+02 J	1.65E+05 J	MG/KG	SJS05-SS51-00-03D	66/66	8.80 - 5500	1.65E+05	3.25E+03	N/A	N/A	N/A	NO	NUT
	7440-47-3	Chromium	2.50E+00	8.67E+02	MG/KG	SJS05-SS19-000	66/66	0.17 - 4.6	8.67E+02	4.50E+01	2.35E+01 N	N/A	N/A	YES	ASL
	7440-48-4	Cobalt	3.90E-01 J	1.77E+01	MG/KG	SJS05-SS01-000	64/66	7.99E-02 - 23	1.77E+01	1.30E+01	1.56E+02 N	N/A	N/A	NO	BSL

Table 2.4

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 5

St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
	7440-50-8	Copper	4.20E+00 J	2.09E+05 J	MG/KG	SJS05-SS44-00-03D	66/66	0.17 - 320	2.09E+05	5.80E+01	3.13E+02 N	N/A	N/A	YES	ASL
	57-12-5	Cyanide	2.10E-01 J	5.20E+00	MG/KG	SJS05-SS51-00-03D	18/59	0.17 - 1.1	5.20E+00	ND	1.56E+02 N	N/A	N/A	NO	BSL
	7439-89-6	Iron	1.73E+03	1.20E+05	MG/KG	SJS05-SS01-000	66/66	2.66 - 46	1.20E+05	6.13E+04	2.35E+03 N	N/A	N/A	YES	ASL
	7439-92-1	Lead	1.04E+01	7.21E+03 J	MG/KG	SJS05-SS01-000	66/66	0.15 - 1.4	7.21E+03	1.47E+02	4.00E+02	N/A	N/A	YES	ASL
	7439-95-4	Magnesium	2.37E+02 J	9.82E+03	MG/KG	SJS05-SS36-000	66/66	3.7 - 2300	9.82E+03	4.51E+03	N/A	N/A	N/A	NO	NUT
	7439-96-5	Manganese	1.60E+01 K	1.87E+03	MG/KG	SJS05-SS36-000	66/66	5.0E-02 - 6.9	1.87E+03	1.98E+02	1.56E+02 N	N/A	N/A	YES	ASL
	7439-97-6	Mercury	3.00E-02 J	1.10E+00	MG/KG	SJS05-SS33-000	58/65	9.9E-03 - 0.24	1.10E+00	1.00E+00	2.30E+00 N	N/A	N/A	NO	BSL
	7440-02-0	Nickel	1.50E+00 J	1.98E+02	MG/KG	SJS05-SS44-00-03D	65/66	0.140 - 18	1.98E+02	1.90E+01	1.56E+02 N	N/A	N/A	YES	ASL
	7440-09-7	Potassium	2.23E+02 J	4.43E+03	MG/KG	SJS05-SS35-000	60/66	2 - 2300	4.43E+03	4.58E+03	N/A	N/A	N/A	NO	NUT
	7782-49-2	Selenium	4.90E-01 J	6.10E+00 L	MG/KG	SJS05-SS44-00-03D	13/66	0.4 - 2.3	6.10E+00	2.00E+00	3.91E+01 N	N/A	N/A	NO	BSL
	7440-22-4	Silver	3.10E-01 J	2.34E+01	MG/KG	SJS05-SS66-00-03D	33/66	0.14 - 4.6	2.34E+01	7.00E-01	3.91E+01 N	N/A	N/A	NO	BSL
	7440-23-5	Sodium	5.86E+01 J	6.41E+03	MG/KG	SJS05-SS18-000	38/66	9.07 - 2300	6.41E+03	6.20E+02	N/A	N/A	N/A	NO	NUT
	7440-28-0	Thallium	4.50E-01 J	7.70E+00	MG/KG	SJS05-SS44-00-03D	19/66	0.31 - 4.6	7.70E+00	ND	5.48E-01 N	N/A	N/A	YES	ASL
	7440-62-2	Vanadium	5.00E+00 J	6.91E+01	MG/KG	SJS05-SS35-000	66/66	9.0E-02 - 23	6.91E+01	1.43E+03	7.80E+00 N	N/A	N/A	YES	ASL
	7440-66-6	Zinc	2.00E+01	1.24E+05	MG/KG	SJS05-SS44-00-03D	66/66	0.28 - 260	1.24E+05	6.13E+04	2.35E+03 N	N/A	N/A	YES	ASL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Dredge Fill Background Upper Tolerance Limit (UTL) from CH2M Hill Final Background Investigation Report. St. Juliens Creek Annex, Chesapeake, Virginia. October 2001.

[4] Risk-Based Concentration Table for Residential Soil, April 14, 2004, U.S. EPA Region III, Jennifer Hubbard.
RBC values for dioxin congeners calculated by adjusting 2,3,7,8-TCDD RBC with appropriate factors from WHO, 1998.
RBC value for trichloroethene is calculated using 1997 NCEA toxicity numbers, and equations in RBC Table.
RBC value for pyrene used as surrogate for phenanthrene and benzo(g,h,i)perylene.
RBC value for endosulfan used as surrogate for endosulfan I, endosulfan II, and endosulfan sulfate.
RBC value for endrin used as surrogate for endrin aldehyde and endrin ketone.
RBC value for chromium VI used for total chromium.
Lead screening toxicity value is 400 mg/kg, the EPA residential soil screening level for lead.
RBC value for manganese-nonfood used as surrogate for manganese.
RBC value for mercuric chloride used as surrogate for mercury.

[5] RBC value for napthalene used as surrogate for acenaphthylene.
Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic
ND - Compounds were analyzed but not detected during Background Investigation
NS- Compounds were not sampled for during Background Investigation

Table 3.1.RME

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 5

St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of (N/T)		Maximum Concentration (Qualifier)		Exposure Point Concentration			
								Value	Units	Statistic	Rationale
At Site 5											
	Benzo(a)pyrene	MG/KG	0.257	0.314	T	1.20	J	0.314	MG/KG	95% UCL-T	(1)
	Dibenz(a,h)anthracene	MG/KG	0.221	0.291	NP	0.560	J	0.291	MG/KG	95% Cheb-m	(3)
	Antimony	MG/KG	4.50	13.94	NP	56.5	L	13.94	MG/KG	97.5% Cheb-m	(3)
	Arsenic	MG/KG	17.4	24.3	T	152		24.3	MG/KG	95% UCL-T	(1)
	Barium	MG/KG	987	3,754	NP	23,900		3,754	MG/KG	97.5% Cheb-m	(3)
	Chromium	MG/KG	35.2	35.1	T	867		35.1	MG/KG	95% UCL-T	(1)
	Copper	MG/KG	4,865	26,629	NP	209,000	J	26,629	MG/KG	97.5% Cheb-m	(3)
	Iron	MG/KG	20,488	25,667	T	120,000		25,667	MG/KG	95% UCL-T	(1)
	Lead	MG/KG	505	1,385	NP	7,210	J	1,385	MG/KG	97.5% Cheb-m	(3)
	Thallium	MG/KG	0.777	1.44	NP	7.70		1.44	MG/KG	95% Cheb-m	(3)
	Zinc	MG/KG	2,540	14,293	NP	124,000		14,293	MG/KG	97.5% Cheb-m	(3)

Full statistics for data included in Appendix F.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.

ProUCL, Version 2.1 used to determine distribution of data using the Shapiro-Wilk W Test. ProUCL used to calculate RME EPC, following recommendations based on distribution and standard deviation in users guide (USEPA. April 2002. ProUCL, Version 2.1. Prepared by Lockheed Martin Environmental Services).

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data, H-Statistic (95% UCL-T); 95% Chebyshev (MVUE) UCL (95% Cheb); 99% Chebyshev (MVUE) UCL (99% Cheb); 95% Chebyshev (mean,std) UCL (95% Cheb-m); 97.5% Chebyshev (mean,std) UCL (97.5% Cheb-m); 99% Chebyshev (mean,std) UCL (99% Cheb-m); Mean of Log-transformed Data (Mean-T).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.

(2) Shapiro-Wilk W Test indicates data are normally distributed.

(3) Shapiro-Wilk W Test indicates data neither log-normally or normally distributed. Use non-parametric RME EPC.

(4) Shapiro-Wilk W Test indicates data fit both log-normal and normal distribution. Select distribution with higher W Test result.

(5) 95% UCL exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.

(6) Max value used because sample size is less than 5.

N = Normal

T = Log-Transformed

NP = Non-Parametric

J - Analyte present. Reported value may or may not be accurate or precise.

K = Biased High

L = Biased Low

MG/KG - micrograms per kilogram

Table 3.2.RME

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 5

St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of (N/T)		Maximum Concentration (Qualifier)		Exposure Point Concentration			
								Value	Units	Statistic	Rationale
At Site 5											
	Benzo(a)pyrene	MG/KG	0.257	0.314	T	1.20	J	0.314	MG/KG	95% UCL-T	(1)
	Dibenz(a,h)anthracene	MG/KG	0.221	0.291	NP	0.560	J	0.291	MG/KG	95% Cheb-m	(3)
	Antimony	MG/KG	4.50	13.94	NP	56.5	L	13.94	MG/KG	97.5% Cheb-m	(3)
	Arsenic	MG/KG	17.4	24.3	T	152		24.3	MG/KG	95% UCL-T	(1)
	Barium	MG/KG	987	3,754	NP	23,900		3,754	MG/KG	97.5% Cheb-m	(3)
	Chromium	MG/KG	35.2	35.1	T	867		35.1	MG/KG	95% UCL-T	(1)
	Copper	MG/KG	4,865	26,629	NP	209,000	J	26,629	MG/KG	97.5% Cheb-m	(3)
	Iron	MG/KG	20,488	25,667	T	120,000		25,667	MG/KG	95% UCL-T	(1)
	Lead	MG/KG	505	1,385	NP	7,210	J	1,385	MG/KG	97.5% Cheb-m	(3)
	Thallium	MG/KG	0.777	1.44	NP	7.70		1.44	MG/KG	95% Cheb-m	(3)
	Zinc	MG/KG	2,540	14,293	NP	124,000		14,293	MG/KG	97.5% Cheb-m	(3)

Full statistics for data included in Appendix F.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.

ProUCL, Version 2.1 used to determine distribution of data using the Shapiro-Wilk W Test. ProUCL used to calculate RME EPC, following recommendations based on distribution and standard deviation in users guide (USEPA. April 2002. ProUCL, Version 2.1. Prepared by Lockheed Martin Environmental Services).

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data, H-Statistic (95% UCL-T); 95% Chebyshev (MVUE) UCL (95% Cheb); 99% Chebyshev (MVUE) UCL (99% Cheb); 95% Chebyshev (mean,std) UCL (95% Cheb-m); 97.5% Chebyshev (mean,std) UCL (97.5% Cheb-m); 99% Chebyshev (mean,std) UCL (99% Cheb-m); Mean of Log-transformed Data (Mean-T).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) Shapiro-Wilk W Test indicates data are normally distributed.
(3) Shapiro-Wilk W Test indicates data neither log-normally or normally distributed. Use non-parametric RME EPC.
(4) Shapiro-Wilk W Test indicates data fit both log-normal and normal distribution. Select distribution with higher W Test result.
(5) 95% UCL exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
(6) Max value used because sample size is less than 5.

N = Normal
T = Log-Transformed
NP = Non-Parametric

J - Analyte present. Reported value may or may not be accurate or precise.
K = Biased High
L = Biased Low
MG/KG - micrograms per kilogram

Table 3.3.RME
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of (N/T)		Maximum Concentration (Qualifier)		Exposure Point Concentration			
								Value	Units	Statistic	Rationale
At Site 5											
	Benzo(a)anthracene	MG/KG	0.269	0.337	(T)	1.50		0.337	MG/KG	95% UCL-T	(1)
	Benzo(a)pyrene	MG/KG	0.257	0.314	(T)	1.20	J	0.314	MG/KG	95% UCL-T	(1)
	Benzo(b)fluoranthene	MG/KG	0.486	0.940	(NP)	2.70		0.940	MG/KG	97.5% Cheb-m	(3)
	Dibenz(a,h)anthracene	MG/KG	0.221	0.291	(NP)	0.560	J	0.291	MG/KG	95% Cheb-m	(3)
	Indeno(1,2,3-cd)pyrene	MG/KG	0.239	0.294	(T)	1.60		0.294	MG/KG	95% UCL-T	(1)
	4,4'-DDE	MG/KG	0.283	1.053	(T)	4.70	J	1.053	MG/KG	95% Cheb	(1)
	4,4'-DDT	MG/KG	0.203	0.378	(T)	3.10	J	0.378	MG/KG	95% UCL-T	(1)
	2,3,7,8-TCDD (dioxin equivalent)	MG/KG	1.42E-05	N/A		2.10E-05		2.10E-05	MG/KG	Max	(6)
	Aluminum	MG/KG	8,856	11,681	(NP)	22,200		11,681	MG/KG	95% Cheb-m	(3)
	Antimony	MG/KG	4.50	13.94	(NP)	56.5	L	13.94	MG/KG	95% Cheb-m	(3)
	Arsenic	MG/KG	17.4	24.3	(T)	152		24.3	MG/KG	95% UCL-T	(1)
	Barium	MG/KG	987	3,754	(NP)	23,900		3,754	MG/KG	97.5% Cheb-m	(3)
	Cadmium	MG/KG	2.22	4.20	(T)	47.8	J	4.20	MG/KG	95% UCL-T	(1)
	Chromium	MG/KG	35.2	35.1	(T)	867		35.1	MG/KG	95% UCL-T	(1)
	Copper	MG/KG	4,865	26,629	(NP)	209,000	J	26,629	MG/KG	97.5% Cheb-m	(3)
	Iron	MG/KG	20,488	25,667	(T)	120,000		25,667	MG/KG	95% UCL-T	(1)
	Lead	MG/KG	505	1,385	(NP)	7,210	J	1,385	MG/KG	97.5% Cheb-m	(3)
	Manganese	MG/KG	206	263	(T)	1,870		263	MG/KG	95% UCL-T	(1)
	Nickel	MG/KG	15.2	30.8	(NP)	198		30.8	MG/KG	95% Cheb-m	(3)
	Thallium	MG/KG	0.777	1.44	(NP)	7.70		1.44	MG/KG	95% Cheb-m	(3)
	Vanadium	MG/KG	29.6	32.8	(N)	69.1		32.8	MG/KG	95% UCL-N	(2)
	Zinc	MG/KG	2,540	14,293	(NP)	124,000		14,293	MG/KG	97.5% Cheb-m	(3)

Full statistics for data included in Appendix F.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.

ProUCL, Version 2.1 used to determine distribution of data using the Shapiro-Wilk W Test. ProUCL used to calculate RME EPC, following recommendations based on distribution and standard deviation in users guide (USEPA. April 2002. ProUCL, Version 2.1. Prepared by Lockheed Martin Environmental Services).

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data, H-Statistic (95% UCL-T); 95% Chebyshev (MVUE) UCL (95% Cheb); 99% Chebyshev (MVUE) UCL (99% Cheb); 95% Chebyshev (mean,std) UCL (95% Cheb-m); 97.5% Chebyshev (mean,std) UCL (97.5% Cheb-m); 99% Chebyshev (mean,std) UCL (99% Cheb-m); Mean of Log-transformed Data (Mean-T).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) Shapiro-Wilk W Test indicates data are normally distributed.
(3) Shapiro-Wilk W Test indicates data neither log-normally or normally distributed. Use non-parametric RME EPC.
(4) Shapiro-Wilk W Test indicates data fit both log-normal and normal distribution. Select distribution with higher W Test result.
(5) 95% UCL exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
(6) Max value used because sample size is less than 5.

N = Normal
T = Log-Transformed
NP = Non-Parametric

J - Analyte present. Reported value may or may not be accurate or precise.
K = Biased High
L = Biased Low
MG/KG - micrograms per kilogram

Table 3.4.RME
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of (N/T)		Maximum Concentration (Qualifier)		Exposure Point Concentration			
								Value	Units	Statistic	Rationale
At Site 5											
	Benzo(a)anthracene	MG/KG	0.269	0.337	(T)	1.50		0.337	MG/KG	95% UCL-T	(1)
	Benzo(a)pyrene	MG/KG	0.257	0.314	(T)	1.20	J	0.314	MG/KG	95% UCL-T	(1)
	Benzo(b)fluoranthene	MG/KG	0.486	0.940	(NP)	2.70		0.940	MG/KG	97.5% Cheb-m	(3)
	Dibenz(a,h)anthracene	MG/KG	0.221	0.291	(NP)	0.560	J	0.291	MG/KG	95% Cheb-m	(3)
	Indeno(1,2,3-cd)pyrene	MG/KG	0.239	0.294	(T)	1.60		0.294	MG/KG	95% UCL-T	(1)
	4,4'-DDE	MG/KG	0.283	1.053	(T)	4.70	J	1.053	MG/KG	95% Cheb	(1)
	4,4'-DDT	MG/KG	0.203	0.378	(T)	3.10	J	0.378	MG/KG	95% UCL-T	(1)
	2,3,7,8-TCDD (dioxin equivalent)	MG/KG	1.42E-05	N/A		2.10E-05		2.10E-05	MG/KG	Max	(6)
	Aluminum	MG/KG	8,856	11,681	(NP)	22,200		11,681	MG/KG	95% Cheb-m	(3)
	Antimony	MG/KG	4.50	13.94	(NP)	56.5	L	13.94	MG/KG	95% Cheb-m	(3)
	Arsenic	MG/KG	17.4	24.3	(T)	152		24.3	MG/KG	95% UCL-T	(1)
	Barium	MG/KG	987	3,754	(NP)	23,900		3,754	MG/KG	97.5% Cheb-m	(3)
	Cadmium	MG/KG	2.22	4.20	(T)	47.8	J	4.20	MG/KG	95% UCL-T	(1)
	Chromium	MG/KG	35.2	35.1	(T)	867		35.1	MG/KG	95% UCL-T	(1)
	Copper	MG/KG	4,865	26,629	(NP)	209,000	J	26,629	MG/KG	97.5% Cheb-m	(3)
	Iron	MG/KG	20,488	25,667	(T)	120,000		25,667	MG/KG	95% UCL-T	(1)
	Lead	MG/KG	505	1,385	(NP)	7,210	J	1,385	MG/KG	97.5% Cheb-m	(3)
	Manganese	MG/KG	206	263	(T)	1,870		263	MG/KG	95% UCL-T	(1)
	Nickel	MG/KG	15.2	30.8	(NP)	198		30.8	MG/KG	95% Cheb-m	(3)
	Thallium	MG/KG	0.777	1.44	(NP)	7.70		1.44	MG/KG	95% Cheb-m	(3)
	Vanadium	MG/KG	29.6	32.8	(N)	69.1		32.8	MG/KG	95% UCL-N	(2)
	Zinc	MG/KG	2,540	14,293	(NP)	124,000		14,293	MG/KG	97.5% Cheb-m	(3)

Full statistics for data included in Appendix F.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.

ProUCL, Version 2.1 used to determine distribution of data using the Shapiro-Wilk W Test. ProUCL used to calculate RME EPC, following recommendations based on distribution and standard deviation in users guide (USEPA. April 2002. ProUCL, Version 2.1. Prepared by Lockheed Martin Environmental Services).

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data, H-Statistic (95% UCL-T); 95% Chebyshev (MVUE) UCL (95% Cheb); 99% Chebyshev (MVUE) UCL (99% Cheb); 95% Chebyshev (mean,std) UCL (95% Cheb-m); 97.5% Chebyshev (mean,std) UCL (97.5% Cheb-m); 99% Chebyshev (mean,std) UCL (99% Cheb-m); Mean of Log-transformed Data (Mean-T).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.

(2) Shapiro-Wilk W Test indicates data are normally distributed.

(3) Shapiro-Wilk W Test indicates data neither log-normally or normally distributed. Use non-parametric RME EPC.

(4) Shapiro-Wilk W Test indicates data fit both log-normal and normal distribution. Select distribution with higher W Test result.

(5) 95% UCL exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.

(6) Max value used because sample size is less than 5.

N = Normal
T = Log-Transformed
NP = Non-Parametric

J - Analyte present. Reported value may or may not be accurate or precise.
K = Biased High
L = Biased Low
MG/KG - micrograms per kilogram

Table 3.1 through 3.4 Supplement
2,3,7,8-TCDD Equivalent Concentrations for Surface Soil

StationID		SJS05-SO44		SJS05-SO50		SJS05-SO53		SJS05-SO66	
SampleID		SJS05-SS44-00-03D		SJS05-SS50-00-03D		SJS05-SS53-00-03D		SJS05-SS66-00-03D	
Site 5		12/10/2003 8:30		12/10/2003 9:45		12/10/2003 10:00		12/10/2003 9:10	
AnalyteName									
DIOXIN(UG/KG)	TEF								
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	0.01	0.056		0.18		0.09		0.077	
1,2,3,4,6,7,8-Heptachlorodibenzofuran	0.01	0.084		0.023		0.01		0.021	
1,2,3,4,7,8,9-Heptachlorodibenzofuran	0.01	0.0077		0.0018	J	0.001	B	0.0017	B
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	0.1	0.0036	J	0.0059	J	0.0016	Q	0.0032	J
1,2,3,4,7,8-Hexachlorodibenzofuran	0.1	0.035		0.0046	J	0.0031	J	0.0048	J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	0.1	0.0057	J	0.0091		0.0036	J	0.0074	J
1,2,3,6,7,8-Hexachlorodibenzofuran	0.1	0.013		0.0056	J	0.0016	J	0.006	J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	0.1	0.0087		0.017		0.0053	J	0.011	
1,2,3,7,8,9-Hexachlorodibenzofuran	0.1	0.0009	J	0.00037	B	0.00024	B	0.00043	B
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	1	0.0035	J	0.0044	J	0.0013	J	0.0035	J
1,2,3,7,8-Pentachlorodibenzofuran	0.05	0.0073		0.0041	J	0.0016	J	0.0064	J
2,3,4,6,7,8-Hexachlorodibenzofuran	0.1	0.019		0.0043	J	0.0014	Q	0.0062	J
2,3,4,7,8-Pentachlorodibenzofuran	0.5	0.011		0.0042	J	0.002	J	0.0078	J
2,3,7,8-TCDD (dioxin)	1	0.00084	B	0.00091	B	0.0013	UJ	0.0012	B
2,3,7,8-Tetrachlorodibenzofuran	0.1	0.0067	J	0.0043	J	0.0017	Q	0.0096	J
Total octachlorodibenzo-p-dioxin	1.00E-04	0.38		2.4		0.86		0.96	
Total octachlorodibenzofuran	1.00E-04	0.1		0.047		0.011		0.014	J
reduced to 1/2 dl if non-detect	TEF	SJS05-SS44-00-03D		SJS05-SS50-00-03D		SJS05-SS53-00-03D		SJS05-SS66-00-03D	
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	0.01	0.056		0.18		0.09		0.077	
1,2,3,4,6,7,8-Heptachlorodibenzofuran	0.01	0.084		0.023		0.01		0.021	
1,2,3,4,7,8,9-Heptachlorodibenzofuran	0.01	0.0077		0.0018		0.001		0.0017	
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	0.1	0.0036		0.0059		0.0016		0.0032	
1,2,3,4,7,8-Hexachlorodibenzofuran	0.1	0.035		0.0046		0.0031		0.0048	
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	0.1	0.0057		0.0091		0.0036		0.0074	
1,2,3,6,7,8-Hexachlorodibenzofuran	0.1	0.013		0.0056		0.0016		0.006	
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	0.1	0.0087		0.017		0.0053		0.011	
1,2,3,7,8,9-Hexachlorodibenzofuran	0.1	0.0009		0.00037		0.00024		0.00043	
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	1	0.0035		0.0044		0.0013		0.0035	
1,2,3,7,8-Pentachlorodibenzofuran	0.05	0.0073		0.0041		0.0016		0.0064	
2,3,4,6,7,8-Hexachlorodibenzofuran	0.1	0.019		0.0043		0.0014		0.0062	
2,3,4,7,8-Pentachlorodibenzofuran	0.5	0.011		0.0042		0.002		0.0078	
2,3,7,8-TCDD (dioxin)	1	0.00084		0.00091		0.00065		0.0012	
2,3,7,8-Tetrachlorodibenzofuran	0.1	0.0067		0.0043		0.0017		0.0096	
Total octachlorodibenzo-p-dioxin	1.00E-04	0.38		2.4		0.86		0.96	

Table 3.1 through 3.4 Supplement
2,3,7,8-TCDD Equivalent Concentrations for Surface Soil

Total octachlorodibenzofuran	1.00E-04	0.1		0.047		0.011		0.014	
Equivelent conc.		SJS05-SS44-00-03D		SJS05-SS50-00-03D		SJS05-SS53-00-03D		SJS05-SS66-00-03D	
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin		0.00056		0.0018		0.0009		0.00077	
1,2,3,4,6,7,8-Heptachlorodibenzofuran		0.00084		0.00023		0.0001		0.00021	
1,2,3,4,7,8,9-Heptachlorodibenzofuran		0.000077		0.000018		0.00001		0.000017	
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin		0.00036		0.00059		0.00016		0.00032	
1,2,3,4,7,8-Hexachlorodibenzofuran		0.0035		0.00046		0.00031		0.00048	
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin		0.00057		0.00091		0.00036		0.00074	
1,2,3,6,7,8-Hexachlorodibenzofuran		0.0013		0.00056		0.00016		0.0006	
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin		0.00087		0.0017		0.00053		0.0011	
1,2,3,7,8,9-Hexachlorodibenzofuran		0.00009		0.000037		0.000024		0.000043	
1,2,3,7,8-Pentachlorodibenzo-p-dioxin		0.0035		0.0044		0.0013		0.0035	
1,2,3,7,8-Pentachlorodibenzofuran		0.000365		0.000205		0.00008		0.00032	
2,3,4,6,7,8-Hexachlorodibenzofuran		0.0019		0.00043		0.00014		0.00062	
2,3,4,7,8-Pentachlorodibenzofuran		0.0055		0.0021		0.001		0.0039	
2,3,7,8-TCDD (dioxin)		0.00084		0.00091		0.00065		0.0012	
2,3,7,8-Tetrachlorodibenzofuran		0.00067		0.00043		0.00017		0.00096	
Total octachlorodibenzo-p-dioxin		0.000038		0.00024		0.000086		0.000096	
Total octachlorodibenzofuran		0.00001		0.0000047		0.0000011		0.0000014	
Sample equivelent concentration		SJS05-SS44-00-03D		SJS05-SS50-00-03D		SJS05-SS53-00-03D		SJS05-SS66-00-03D	
2,3,7,8-TCDD equiv conc for samples		0.02099		0.0150247		0.0059811		0.0148774	
	ug/kg		**mg/kg**						
	max conc	**0.02099**	**2.1E-05**						
	mean conc	**0.0142183**	**1.42E-05**						

Table 3.1.CT

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 5

St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of (N/T)		Maximum Concentration (Qualifier)		Exposure Point Concentration			
								Value	Units	Statistic	Rationale
At Site 5											
	Benzo(a)pyrene	MG/KG	0.257	0.314	T	1.20	J	0.256	MG/KG	Mean-T	(1)
	Dibenz(a,h)anthracene	MG/KG	0.221	0.291	NP	0.560	J	0.221	MG/KG	Mean-N	(3)
	Antimony	MG/KG	4.50	13.94	NP	56.5	L	4.50	MG/KG	Mean-N	(3)
	Arsenic	MG/KG	17.4	24.3	T	152		16.8	MG/KG	Mean-T	(1)
	Barium	MG/KG	987	3,754	NP	23,900		987	MG/KG	Mean-N	(3)
	Chromium	MG/KG	35.2	35.1	T	867		27.4	MG/KG	Mean-T	(1)
	Copper	MG/KG	4,865	26,629	NP	209,000	J	4,865	MG/KG	Mean-N	(3)
	Iron	MG/KG	20,488	25,667	T	120,000		20,784	MG/KG	Mean-T	(1)
	Lead	MG/KG	505	1,385	NP	7,210	J	505	MG/KG	Mean-N	(3)
	Thallium	MG/KG	0.777	1.44	NP	7.70		0.78	MG/KG	Mean-N	(3)
	Zinc	MG/KG	2,540	14,293	NP	124,000		2,540	MG/KG	Mean-N	(3)

Full statistics for data included in Appendix F.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.

ProUCL, Version 2.1 used to determine distribution of data using the Shapiro-Wilk W Test. ProUCL used to calculate RME EPC, following recommendations based on distribution and standard deviation in users guide (USEPA. April 2002. ProUCL, Version 2.1. Prepared by Lockheed Martin Environmental Services).

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data, H-Statistic (95% UCL-T); 95% Chebyshev (MVUE) UCL (95% Cheb); 99% Chebyshev (MVUE) UCL (99% Cheb); 95% Chebyshev (mean,std) UCL (95% Cheb-m); 97.5% Chebyshev (mean,std) UCL (97.5% Cheb-m); 99% Chebyshev (mean,std) UCL (99% Cheb-m); MVU estimate of the mean (Mean-T); Mean of Normal Data (Mean-N)

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) Shapiro-Wilk W Test indicates data are normally distributed.
(3) Shapiro-Wilk W Test indicates data neither log-normally or normally distributed. Use non-parametric RME EPC.
(4) Shapiro-Wilk W Test indicates data fit both log-normal and normal distribution. Select distribution with higher W Test result.
(5) 95% UCL exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
(6) Max value used because sample size is less than 5.

N = Normal
T = Log-Transformed
NP = Non-Parametric

J - Analyte present. Reported value may or may not be accurate or precise.
K = Biased High
L = Biased Low
MG/KG - micrograms per kilogram

Table 3.2.CT

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 5

St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of (N/T)		Maximum Concentration (Qualifier)		Exposure Point Concentration			
								Value	Units	Statistic	Rationale
At Site 5											
	Benzo(a)pyrene	MG/KG	0.257	0.314	T	1.20	J	0.256	MG/KG	Mean-T	(1)
	Dibenz(a,h)anthracene	MG/KG	0.221	0.291	NP	0.560	J	0.221	MG/KG	Mean-N	(3)
	Antimony	MG/KG	4.50	13.94	NP	56.5	L	4.50	MG/KG	Mean-N	(3)
	Arsenic	MG/KG	17.4	24.3	T	152		16.8	MG/KG	Mean-T	(1)
	Barium	MG/KG	987	3,754	NP	23,900		987	MG/KG	Mean-N	(3)
	Chromium	MG/KG	35.2	35.1	T	867		27.4	MG/KG	Mean-T	(1)
	Copper	MG/KG	4,865	26,629	NP	209,000	J	4,865	MG/KG	Mean-N	(3)
	Iron	MG/KG	20,488	25,667	T	120,000		20,784	MG/KG	Mean-T	(1)
	Lead	MG/KG	505	1,385	NP	7,210	J	505	MG/KG	Mean-N	(3)
	Thallium	MG/KG	0.777	1.44	NP	7.70		0.78	MG/KG	Mean-N	(3)
	Zinc	MG/KG	2,540	14,293	NP	124,000		2,540	MG/KG	Mean-N	(3)

Full statistics for data included in Appendix F.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.

ProUCL, Version 2.1 used to determine distribution of data using the Shapiro-Wilk W Test. ProUCL used to calculate RME EPC, following recommendations based on distribution and standard deviation in users guide (USEPA. April 2002. ProUCL, Version 2.1. Prepared by Lockheed Martin Environmental Services).

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data, H-Statistic (95% UCL-T); 95% Chebyshev (MVUE) UCL (95% Cheb); 99% Chebyshev (MVUE) UCL (99% Cheb); 95% Chebyshev (mean,std) UCL (95% Cheb-m); 97.5% Chebyshev (mean,std) UCL (97.5% Cheb-m); 99% Chebyshev (mean,std) UCL (99% Cheb-m); MVU estimate of the mean (Mean-T); Mean of Normal Data (Mean-N)

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(5) 95% UCL exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
(6) Max value used because sample size is less than 5.

N = Normal
T = Log-Transformed
NP = Non-Parametric

J - Analyte present. Reported value may or may not be accurate or precise.
K = Biased High
L = Biased Low
MG/KG - micrograms per kilogram

Table 3.3.CT

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 5

St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of (N/T)		Maximum Concentration (Qualifier)		Exposure Point Concentration			
								Value	Units	Statistic	Rationale
At Site 5											
	Benzo(a)anthracene	MG/KG	0.269	0.337	(T)	1.50		0.267	MG/KG	Mean-T	(1)
	Benzo(a)pyrene	MG/KG	0.257	0.314	(T)	1.20	J	0.256	MG/KG	Mean-T	(1)
	Benzo(b)fluoranthene	MG/KG	0.486	0.940	(NP)	2.70		0.486	MG/KG	Mean-N	(3)
	Dibenz(a,h)anthracene	MG/KG	0.221	0.291	(NP)	0.560	J	0.221	MG/KG	Mean-N	(3)
	Indeno(1,2,3-cd)pyrene	MG/KG	0.239	0.294	(T)	1.60		0.237	MG/KG	Mean-T	(1)
	4,4'-DDE	MG/KG	0.283	1.053	(T)	4.70	J	0.385	MG/KG	Mean-T	(1)
	4,4'-DDT	MG/KG	0.203	0.378	(T)	3.10	J	0.159	MG/KG	Mean-T	(1)
	2,3,7,8-TCDD (dioxin equivalent)	MG/KG	1.42E-05	N/A		2.10E-05		2.10E-05	MG/KG	Max	(6)
	Aluminum	MG/KG	8,856	11,681	(NP)	22,200		8,856	MG/KG	Mean-N	(3)
	Antimony	MG/KG	4.50	13.94	(NP)	56.5	L	4.50	MG/KG	Mean-N	(3)
	Arsenic	MG/KG	17.4	24.3	(T)	152		3.1	MG/KG	Mean-T	(1)
	Barium	MG/KG	987	3,754	(NP)	23,900		987	MG/KG	Mean-N	(3)
	Cadmium	MG/KG	2.22	4.20	(T)	47.8	J	1.73	MG/KG	Mean-T	(1)
	Chromium	MG/KG	35.2	35.1	(T)	867		27.4	MG/KG	Mean-T	(1)
	Copper	MG/KG	4,865	26,629	(NP)	209,000	J	4,865	MG/KG	Mean-N	(3)
	Iron	MG/KG	20,488	25,667	(T)	120,000		20,784	MG/KG	Mean-T	(1)
	Lead	MG/KG	505	1,385	(NP)	7,210	J	505	MG/KG	Mean-N	(3)
	Manganese	MG/KG	206	263	(T)	1,870		200	MG/KG	Mean-T	(1)
	Nickel	MG/KG	15.2	30.8	(NP)	198		15.2	MG/KG	Mean-N	(3)
	Thallium	MG/KG	0.777	1.44	(NP)	7.70		0.78	MG/KG	Mean-N	(3)
	Vanadium	MG/KG	29.6	32.8	(N)	69.1		29.6	MG/KG	Mean-N	(2)
	Zinc	MG/KG	2,540	14,293	(NP)	124,000		2,540	MG/KG	Mean-N	(3)

Full statistics for data included in Appendix F.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.

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(3) Shapiro-Wilk W Test indicates data neither log-normally or normally distributed. Use non-parametric RME EPC.

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L = Biased Low

MG/KG - micrograms per kilogram

Table 3.4.CT

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 5

St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of (N/T)		Maximum Concentration (Qualifier)		Exposure Point Concentration			
								Value	Units	Statistic	Rationale
At Site 5											
	Benzo(a)anthracene	MG/KG	0.269	0.337	(T)	1.50		0.267	MG/KG	Mean-T	(1)
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	Benzo(b)fluoranthene	MG/KG	0.486	0.940	(NP)	2.70		0.486	MG/KG	Mean-N	(3)
	Dibenz(a,h)anthracene	MG/KG	0.221	0.291	(NP)	0.560	J	0.221	MG/KG	Mean-N	(3)
	Indeno(1,2,3-cd)pyrene	MG/KG	0.239	0.294	(T)	1.60		0.237	MG/KG	Mean-T	(1)
	4,4'-DDE	MG/KG	0.283	1.053	(T)	4.70	J	0.385	MG/KG	Mean-T	(1)
	4,4'-DDT	MG/KG	0.203	0.378	(T)	3.10	J	0.159	MG/KG	Mean-T	(1)
	2,3,7,8-TCDD (dioxin equivalent)	MG/KG	1.42E-05	N/A		2.10E-05		2.10E-05	MG/KG	Max	(6)
	Aluminum	MG/KG	8,856	11,681	(NP)	22,200		8,856	MG/KG	Mean-N	(3)
	Antimony	MG/KG	4.50	13.94	(NP)	56.5	L	4.50	MG/KG	Mean-N	(3)
	Arsenic	MG/KG	17.4	24.3	(T)	152		3.1	MG/KG	Mean-T	(1)
	Barium	MG/KG	987	3,754	(NP)	23,900		987	MG/KG	Mean-N	(3)
	Cadmium	MG/KG	2.22	4.20	(T)	47.8	J	1.73	MG/KG	Mean-T	(1)
	Chromium	MG/KG	35.2	35.1	(T)	867		27.4	MG/KG	Mean-T	(1)
	Copper	MG/KG	4,865	26,629	(NP)	209,000	J	4,865	MG/KG	Mean-N	(3)
	Iron	MG/KG	20,488	25,667	(T)	120,000		20,784	MG/KG	Mean-T	(1)
	Lead	MG/KG	505	1,385	(NP)	7,210	J	505	MG/KG	Mean-N	(3)
	Manganese	MG/KG	206	263	(T)	1,870		200	MG/KG	Mean-T	(1)
	Nickel	MG/KG	15.2	30.8	(NP)	198		15.2	MG/KG	Mean-N	(3)
	Thallium	MG/KG	0.777	1.44	(NP)	7.70		0.78	MG/KG	Mean-N	(3)
	Vanadium	MG/KG	29.6	32.8	(N)	69.1		29.6	MG/KG	Mean-N	(2)
	Zinc	MG/KG	2,540	14,293	(NP)	124,000		2,540	MG/KG	Mean-N	(3)

Full statistics for data included in Appendix F.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.

ProUCL, Version 2.1 used to determine distribution of data using the Shapiro-Wilk W Test. ProUCL used to calculate RME EPC, following recommendations based on distribution and standard deviation in users guide (USEPA. April 2002. ProUCL, Version 2.1. Prepared by Lockheed Martin Environmental Services).

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(1) Shapiro-Wilk W Test indicates data are log-normally distributed.

(2) Shapiro-Wilk W Test indicates data are normally distributed.

(3) Shapiro-Wilk W Test indicates data neither log-normally or normally distributed. Use non-parametric RME EPC.

(4) Shapiro-Wilk W Test indicates data fit both log-normal and normal distribution. Select distribution with higher W Test result.

(5) 95% UCL exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.

(6) Max value used because sample size is less than 5.

N = Normal

T = Log-Transformed

NP = Non-Parametric

J - Analyte present. Reported value may or may not be accurate or precise.

K = Biased High

L = Biased Low

MG/KG - micrograms per kilogram

Table 4.1
Values Used for Daily Intake Calculations
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: At Site 5
Receptor Population: Trespasser
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	See Table 3.1	--	See Table 3.1	--	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	50	EPA, 1997	CS x IR x EF x ED x CF1 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	52 [1]	Professional judgment	26 [1]	Professional judgment	
	ED	Exposure Duration	years	30	EPA, 1991	15 [1]	Professional judgment	
	CF1	Conversion Factor	kg/mg	1.00E-06	NA	1.00E-06	NA	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time - Cancer	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time - Non-Cancer	days	10,950	EPA, 1989	5,475	EPA, 1989	
Dermal	CS	Chemical Concentration in Soil	mg/kg	See Table 3.1	--	See Table 3.1	--	CDI (mg/kg-day)=
	CF1	Conversion Factor	kg/mg	1.00E-06	NA	1.00E-06	NA	CS x CF1 x SA x AF x AB x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm^2	5,000	EPA, 1997	1,000	EPA, 1997	
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.19	EPA, 1997	0.19	EPA, 1997	
	AB	Absorption Factor	unitless	Chemical Specific	EPA, 1995	Chemical Specific	EPA, 1995	
	EF	Exposure Frequency	days/year	52 [1]	Professional judgment	26 [1]	Professional judgment	
	ED	Exposure Duration	years	30	EPA, 1991	15 [1]	Professional judgment	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time - Cancer	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time - Non-Cancer	days	10,950	EPA, 1989	5,475	EPA, 1989	

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03,

EPA, 1995: Assessing Dermal Exposure from Soil, Technical Guidance Manual, Region III, EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook, Vol. 1. EPA/600/P-95/002Fa. The RME skin surface area is obtained from Table 6-14, central tendency surface area for outdoor soil contact (assumes 25% of total surface area).

The CT surface area assumes exposure to hands and feet and is obtained by averaging both male and female hands and feet mean values found on Table 6-4.

CT soil ingestion rate found on Table 4-23. Soil to Skin Adherence Factor calculated from Table 6-12 by averaging hand values for gardeners no. 1 an 2. (No trespasser activity on Table 6-12).

TBD = To Be Determined

NA = Not Available

Note:

1. For RME values, assumes trespassing one hour per day, one day per week for 52 weeks per year. For CT values, assumes one-half of RME values.

Table 4.2
Values Used for Daily Intake Calculations
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: At Site 5
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	See Table 3.1	--	See Table 3.1	--	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	50	EPA, 1997	CS x IR x EF x ED x CF1 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	52 [1]	Professional judgement	26 [1]	Professional judgement	
	ED	Exposure Duration	years	6	EPA, 1991	6	EPA, 1991	
	CF1	Conversion Factor	kg/mg	1.00E-06	NA	1.00E-06	NA	
	BW	Body Weight	kg	56	EPA, 1997	56	EPA, 1997	
	AT-C	Averaging Time - Cancer	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time - Non-Cancer	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal	CS	Chemical Concentration in Soil	mg/kg	See Table 3.1	--	See Table 3.1	--	CDI (mg/kg-day)=
	CF1	Conversion Factor	kg/mg	1.00E-06	NA	1.00E-06	NA	CS x CF1 x SA x AF x AB x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm^2	4,000	EPA, 1997	2,000	EPA, 1997	
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.11	EPA, 1997	0.11	EPA, 1997	
	AB	Absorption Factor	unitless	Chemical Specific	EPA, 1995	Chemical Specific	EPA, 1995	
	EF	Exposure Frequency	days/year	52 [1]	Professional judgement	26 [1]	Professional judgement	
	ED	Exposure Duration	years	6	EPA, 1991	6	EPA, 1991	
	BW	Body Weight	kg	56	EPA, 1997	56	EPA, 1997	
	AT-C	Averaging Time - Cancer	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time - Non-Cancer	days	2,190	EPA, 1989	2,190	EPA, 1989	

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03,

EPA, 1993: Superfund Standard Default Exposure Factors for Central Tendency and Reasonable Maximum Exposures.

EPA, 1995: Assessing Dermal Exposure from Soil, Technical Guidance manual, Region III, EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook, Vol. 1. EPA/600/P-95/002Fa. The skin surface area presented in this table includes hands, forearms, lower legs, and feet (assumes 25% of total surface area) and is obtained by averaging the 50 percentile total body surface area of male and female children ages 12 through 17 and dividing by 4.

The CT skin surface area is for hands and feet and is calculated by averaging the mean percentage of total surface body area for hands and feet (approximately 13%) for children ages 12 through 17 found on Table 6-8, then multiplying by total surface body area (16,000 cm^2).

Mean body weight for adolescent derived by averaging the mean (12 to 17 years) boy and girl values (see Table 7-3).

Soil to Skin Adherence Factor obtained from Table 6-12 for the Soccer No. 1 activity (most conservative) for hands.

TBD = To Be Determined

NA = Not Available

Note:

1. For RME values, assumes trespassing one hour per day, one day per week for 52 weeks per year. For CT values, assumes one-half of RME values.

Table 4.3
Values Used for Daily Intake Calculations
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from Surface Soil at Site 5
Receptor Population: Trespasser
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	See Table 3.2	--	See Table 3.2	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	Calculated	--	Calculated	--	CA x IR x ET x EF x ED x 1/BW x 1/AT
	IR	Inhalation Rate	m^3/hour	1.6	EPA, 1997	1	EPA, 1997	
	PEF	Particulate Emissions Factor	m^3/kg	1.32E+09	--	1.32E+09	--	CA (mg/m^3) = CS (1/PEF + 1/VF)
	VF	Volatilization Factor for Volatile Constituents	m^3/kg	Calculated [2]	--	Calculated [2]	--	
	ET	Exposure Time	hr/day	1 [1]	Professional judgment	0.5 [1]	Professional judgment	
	EF	Exposure Frequency	days/year	52 [1]	Professional judgment	26 [1]	Professional judgment	
	ED	Exposure Duration	years	30	EPA, 1991	15 [1]	Professional judgment	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	10,950	EPA, 1989	5,475	EPA, 1989	

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

Inhalation rates are based on adult values assuming moderate activity for the RME and light activity for the CT (Table 5-23 of EPA, 1997).

TBD = To Be Determined

Notes:

1. For RME values, assumes trespassing one hour per day, one day per week for 52 weeks per year. For CT values, assumes one-half of RME values.
2. See RAGS Part D Standard Tables 7 and 8 for calculation.

Table 4.4
Values Used for Daily Intake Calculations
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from Surface Soil at Site 5
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	See Table 3.2	--	See Table 3.2	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	Calculated	--	Calculated	--	CA x IR x ET x EF x ED x 1/BW x 1/AT
	IR	Inhalation Rate	m^3/hour	1.4	EPA, 1997	1	EPA, 1997	
	PEF	Particulate Emissions Factor	m^3/kg	1.32E+09	--	1.32E+09	--	CA (mg/m^3) = CS (1/PEF + 1/VF)
	VF	Volatilization Factor for Volatile Constituents	m^3/kg	Calculated [2]	--	Calculated [2]	--	
	ET	Exposure Time	hr/day	1 [1]	Professional judgment	0.5 [1]	Professional judgment	
	EF	Exposure Frequency	days/year	52 [1]	Professional judgment	26 [1]	Professional judgment	
	ED	Exposure Duration	years	6	EPA, 1991	6	EPA, 1991	
	BW	Body Weight	kg	56	EPA, 1991	56	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

Inhalation rates are based on averaging the adult and child values assuming moderate activity for the RME and light activity for the CT (Table 5-23 of EPA, 1997).

Mean body weight for adolescent derived by averaging the mean (12 to 17 years) boy and girl values (see Table 7-3).

TBD = To Be Determined

Notes:

1. For RME values, assumes trespassing one hour per day, one day per week for 52 weeks per year. For CT values, assumes one-half of RME values.

2. See RAGS Part D Standard Tables 7 and 8 for calculation.

Table 4.5
Values Used for Daily Intake Calculations
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: At Site 5
Receptor Population: Other Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	See Table 3.8	--	See Table 3.8	--	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR-S	Ingestion Rate of Soil	mg/day	50	VADEQ, 1997	25 [1]	Professional judgment	CS x IR x EF x ED x CF1 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	250	EPA, 1991	219	EPA, 1993	
	ED	Exposure Duration	years	25	EPA, 1991	5	EPA, 1993	
	CF1	Conversion Factor	kg/mg	1.00E-06	NA	1.00E-06	NA	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time - Cancer	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time - Non-Cancer	days	9,125	EPA, 1989	1,825	EPA, 1989	
Dermal	CS	Chemical Concentration in Soil	mg/kg	See Table 3.8	--	See Table 3.8	--	CDI (mg/kg-day)=
	CF1	Conversion Factor	kg/mg	1.00E-06	NA	1.00E-06	NA	CS x CF1 x SA x AF x AB x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm^2	5,000	EPA, 1997	1,000	EPA, 1997	
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.071	EPA, 1997	0.071	EPA, 1997	
	AB	Absorption Factor	unitless	chemical-specific	EPA, 1995	chemical-specific	EPA, 1995	
	EF	Exposure Frequency	days/year	250	EPA, 1991	219	EPA, 1993	
	ED	Exposure Duration	years	25	EPA, 1991	5	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time - Cancer	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time - Non-Cancer	days	9,125	EPA, 1989	1,825	EPA, 1989	

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03,

EPA, 1993: Superfund Standard default Exposure Factors for Central Tendency and Reasonable Maximum Exposures.

EPA, 1995: Assessing Dermal Exposure from Soil, Technical Guidance manual, Region III, EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook, Vol. 1. EPA/600/P-95/002Fa. The RME skin surface area assumes 25% of total surface area of 20,000.

The CT surface area assumes exposure to hands and feet and is obtained by averaging both male and female hands and feet mean values found on Table 6-4.

The RME and CT Soil to Skin Adherence Factor is calculated from Table 6-12 using the average of the five groundskeepers' values for hands.

VADEQ, 1997: Value provided by Pat McMurray, Virginia Department of Environmental Quality, during St. Juliens Creek risk assessment assumptions conference call on November 20, 1997.

TBD = To Be Determined

NA = Not Available

Note:

1. CT value assumes one-half the RME value.

Table 4.6
Values Used for Daily Intake Calculations
Site 5
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: At Site 5
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	See Table 3.7	--	See Table 3.7	--	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	50	EPA, 1997	CS x IR x EF x ED x CF1 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	CF1	Conversion Factor	kg/mg	1.00E-06	NA	1.00E-06	NA	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time - Cancer	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time - Non-Cancer	days	8,760	EPA, 1989	3,285	EPA, 1989	
Dermal	CS	Chemical Concentration in Soil	mg/kg	See Table 3.7	--	See Table 3.7	--	CDI (mg/kg-day)=
	CF1	Conversion Factor	kg/mg	1.00E-06	NA	1.00E-06	NA	CS x CF1 x SA x AF x AB x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm^2	5,000	EPA, 1997	1,000	EPA, 1997	
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.19	EPA, 1997	0.19	EPA, 1997	
	AB	Absorption Factor	unitless	Chemical Specific	EPA, 1995	Chemical Specific	EPA, 1995	
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1997	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time - Cancer	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time - Non-Cancer	days	8,760	EPA, 1989	3,285	EPA, 1989	

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03,

EPA, 1993: Superfund Standard Default Exposure Factors for Central Tendency and Reasonable Maximum Exposures.

EPA, 1995: Assessing Dermal Exposure from Soil, Technical Guidance manual, Region III, EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook, Vol. 1. EPA/600/P-95/002Fa. The RME skin surface area is obtained from Table 6-14, central tendency surface area for outdoor soil contact (assumes 25% of total surface area).

The CT surface area assumes exposure to hands and feet and is obtained by averaging both male and female hands and feet mean values found on Table 6-4.

CT soil ingestion rate found on Table 4-23. Soil to Skin Adherence Factor calculated from Table 6-12 by averaging hand values for gardeners no. 1 and 2.

TBD = To Be Determined

NA = Not Available

Table 4.7
Values Used for Daily Intake Calculations
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: At Site 5
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	See Table 3.7	--	See Table 3.7	--	Chronic Daily Intake (CDI) (mg/kg-day)=
	IR-S	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	EPA, 1997	CS x IR x EF x ED x CF1 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	6	EPA, 1991	6	EPA, 1991	
	CF1	Conversion Factor	kg/mg	1.00E-06	NA	1.00E-06	NA	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time - Cancer	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time - Non-Cancer	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal	CS	Chemical Concentration in Soil	mg/kg	See Table 3.7	--	See Table 3.7	--	CDI (mg/kg-day)=
	CF1	Conversion Factor	kg/mg	1.00E-06	NA	1.00E-06	NA	CS x CF1 x SA x AF x AB x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm^2	3,600	EPA, 1997	864	EPA, 1997	
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.11	EPA, 1997	0.11	EPA, 1997	
	AB	Absorption Factor	unitless	Chemical Specific	EPA, 1995	Chemical Specific	EPA, 1995	
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	6	EPA, 1991	6	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time - Cancer	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time - Non-Cancer	days	2,190	EPA, 1989	2,190	EPA, 1989	

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03,

EPA, 1993: Superfund Standard Default Exposure Factors for Central Tendency and Reasonable Maximum Exposures.

EPA, 1995: Assessing Dermal Exposure from Soil, Technical Guidance Manual, Region III, EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook, Vol. 1. EPA/600/P-95/002Fa. The RME skin surface area is for hands, arms, legs, and feet (assumes 50% of total surface area) and is obtained by averaging the 50% values of male and female children from age 2 through 7 years found on Table 6-6 and 6-7 and dividing by 2. The CT skin surface area is for hands and feet and is calculated by averaging the mean percentage of total surface body area for hands and feet (approximately 12%) for children ages 1 through 7 found on Table 6-8, then multiplying by the total surface body area (7,200 cm^2).

CT soil ingestion rate found on Table 4-23. Soil to Skin Adherence Factor obtained from Table 6-12 for the Soccer No. 1 activity (most conservative) for hands.

TBD = To Be Determined

NA = Not Available

Table 4.8
Values Used for Daily Intake Calculations
Site 5
St. Juliens Creek Annex
Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: At Site 5
Receptor Population: Resident
Receptor Age: Adult/Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	See Table 3.7	--	See Table 3.7	see Table 3	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	EPA, 1997	CS x IR-S-Adj x EF x CF3 x 1/AT
	IR-S-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	EPA, 1997	
	IR-S-Adj	Ingestion Rate of Soil, Age-adjusted	mg-year/kg-day	114.29	Calculated	46.43	Calculated	IR-S-Adj (mg-year/kg-day) =
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	(ED-C x IR-S-C / BW-C) + (ED-A x IR-S-A / BW-A)
	ED-A	Exposure Duration, Adult	years	24	EPA, 1991	9	EPA, 1993	
	ED-C	Exposure Duration, Child	years	6	EPA, 1991	6	EPA, 1991	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW-A	Body Weight , Adult	kg	70	EPA, 1991	70	EPA, 1991	
	BW-C	Body Weight, Child	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	See Table 3.7	--	See Table 3.7	see Table 3	CDI (mg/kg-day) =
	SA-A	Skin Surface Area Available for Contact, Adult	cm^2	5,000	EPA, 1997	1,000	EPA, 1997	CS x DA-Adj x DABS x CF3 x EF x 1/AT
	SA-C	Skin Surface Area Available for Contact, Child	cm^2	3,600	EPA, 1997	864	EPA, 1997	
	SSAF-A	Soil to Skin Adherence Factor	mg/cm^2-day	0.19	EPA, 1997	0.19	EPA, 1997	DA-Adj (mg-year/kg-day) =
	SSAF-C	Soil to Skin Adherence Factor	mg/cm^2-day	0.11	EPA, 1997	0.11	EPA, 1997	[(ED-C x SA-C x SSAF-C / BW-C) +
	DA-Adj	Dermal Absorption, Age-adjusted	mg-year/kg-day	484	calculated	62.4	calculated	(ED-A x SA-A x SSAF-A / BW-A)]
	AB	Absorption Factor	unitless	Chemical Specific	EPA, 1995	Chemical Specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED-A	Exposure Duration, Adult	years	24	EPA, 1991	9	EPA, 1993	
	ED-C	Exposure Duration, Child	years	6	EPA, 1991	6	EPA, 1991	
	BW-A	Body Weight , Adult	kg	70	EPA, 1991	70	EPA, 1991	
	BW-C	Body Weight, Child	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook, Vol. 1. EPA/600/P-95/002Fa.

TABLE 5.1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

Site 5, St. Juliens Creek

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (3) (MM/DD/YY)
Aluminum	Chronic	1.0E+00	mg/kg-day	N/A	1.0E+00	mg/kg-day	CNS	100	NCEA	08/26/96
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Antimony	Chronic	4.0E-04	mg/kg-day	15%	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	02/07/02
	Subchronic	4.0E-04	mg/kg-day	15%	6.0E-05	mg/kg-day	Blood	1000	HEAST	07/01/97
Arsenic	Chronic	3.0E-04	mg/kg-day	95%	3.0E-04	mg/kg-day	Skin/vascular	3/1	IRIS	02/07/02
	Subchronic	3.0E-04	mg/kg-day	95%	3.0E-04	mg/kg-day	Skin/vascular	3	HEAST	07/01/97
Barium	Chronic	7.0E-02	mg/kg-day	7%	4.9E-03	mg/kg-day	Kidney, Cardiovascular	3/1	IRIS	02/07/02
	Subchronic	7.0E-02	mg/kg-day	7%	4.9E-03	mg/kg-day	N/A	N/A	HEAST	07/01/97
Benzo(a)anthracene	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(b)fluoranthene	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cadmium (water)	Chronic	5.0E-04	mg/kg-day	2.5%	1.3E-05	mg/kg-day	Kidney	10/1	IRIS	02/07/02
(for water and air)	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cadmium (food)	Chronic	1.0E-03	mg/kg-day	2.5%	2.5E-05	mg/kg-day	Kidney	10/1	IRIS	02/07/02
(for soil)	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chromium (hexavalent)	Chronic	3.0E-03	mg/kg-day	2.5%	7.5E-05	mg/kg-day	GI, NOAEL	300/3	IRIS	02/07/02
	Subchronic	2.0E-02	mg/kg-day	2.5%	5.0E-04	mg/kg-day	GI, NOAEL	100	HEAST	07/01/97
Copper	Chronic	4.0E-02	mg/kg-day	N/A	4.0E-02	mg/kg-day	Gastrointestinal	N/A	HEAST	07/01/97
	Subchronic	4.0E-02	mg/kg-day	N/A	4.0E-02	mg/kg-day	Gastrointestinal	N/A	HEAST	07/01/97
Dibenzo(a,h)anthracene	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4,4'DDE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4-DDT	Chronic	5.0E-04	mg/kg/day	70 - 90%	5.0E-04	mg/kg/day	Liver	100	IRIS	05/04/01
	Subchronic	5.0E-04	mg/kg/day	70 - 90%	5.0E-04	mg/kg/day	Liver	100	HEAST	07/01/97
Indeno(1,2,3-cd)pyrene	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Iron	Chronic	3.0E-01	mg/kg-day	N/A	3.0E-01	mg/kg-day	Gastrointestinal	1	NCEA	07/23/96
Lead	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Manganese (nonfood)	Chronic	2.0E-02	mg/kg-day	4%	8.0E-04	mg/kg-day	CNS	1/1	IRIS	02/07/02
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Manganese (food)	Chronic	1.4E-01	mg/kg-day	4%	5.6E-03	mg/kg-day	CNS	1/1	IRIS	02/07/02
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Nickel	Chronic	2.0E-02	mg/kg-day	4%	8.0E-04	mg/kg-day	Decreased Body Weight	300/1	IRIS	02/07/02
	Subchronic	2.0E-02	mg/kg-day	4%	8.0E-04	mg/kg-day	Decreased Body Weight	300	HEAST	07/01/97
2,3,7,8-TCDD	Chronic	N/A	N/A	50-80%	N/A	N/A	N/A	N/A	N/A	N/A
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Thallium	Chronic	7.0E-05	mg/kg-day	100%	7.0E-05	mg/kg-day	Skin, Vascular, Liver, Blood, Hair	3/1	RBC	04/25/03
	Subchronic	7.0E-05	mg/kg-day	100%	7.0E-05	mg/kg-day	Skin	3	HEAST	07/01/97
Vanadium	Chronic	1.0E-03	mg/kg-day	2.6%	2.6E-05	mg/kg-day	Kidney	100	NCEA	05/01/00
	Subchronic	1.0E-03	mg/kg-day	2.6%	2.6E-05	mg/kg-day	Kidney	100	NCEA	05/01/00

TABLE 5.1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

Site 5, St. Juliens Creek

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (3) (MM/DD/YY)
Zinc	Chronic	3.0E-01	mg/kg-day	N/A	3.0E-01	mg/kg-day	Blood	3/1	IRIS	02/07/02
	Subchronic	3.0E-01	mg/kg-day	N/A	3.0E-01	mg/kg-day	Blood	3	HEAST	07/01/97

N/A = Not Applicable or Not Available. IRIS indicates that calculations of dermal risks may not be appropriate for this chemical.

(1) Refer to RAGS, Part E. 2001.

ATSDR = Agency for Toxic Substances and Disease Registry

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

NCEA = National Center for Environmental Assessment

RBC = USEPA Region III Risk-Based Concentration Table

(2) Provide equation for derivation in text.

(3) For IRIS values, provide the date IRIS was searched.

For HEAST values, provide the date of HEAST.

For NCEA values, provide the date of the article provided by NCEA.

CNS = Central Nervous System

NOAEL = No adverse effect level

TABLE 5.2
NON-CANCER TOXICITY DATA -- INHALATION
Site 5, St. Juliens Creek

Chemical of Potential Concern	Chronic/ Subchronic	Value Inhalation RfC	Units	Adjusted Inhalation RfD (1)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfC:RfD: Target Organ (2)	Dates (3) (MM/DD/YY)
Aluminum	Chronic	3.50E-03	mg/m^3	1.00E-03	mg/kg-day	CNS	300	NCEA	08/26/96
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Antimony	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Barium	Chronic	4.90E-04	mg/m^3	1.40E-04	mg/kg-day	Fetus. Cardiovascular	N/A	N/A	N/A
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)anthracene	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(b)fluoranthene	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cadmium	Chronic	2.0E-04	mg/m3	5.7E-05	mg/kg-day	Kidney	N/A	N/A	N/A
	Subchronic	9.0E-04	mg/m3	2.6E-04	mg/kg-day	Kidney	N/A	N/A	N/A
Chromium (hexavalent)	Chronic	1.05E-04	mg/m^3	3.00E-05	mg/kg-day	Respiratory System	300/1	IRIS	04/05/04
	Subchronic	4.00E-06	mg/m^3	1.1E-06	mg/kg-day	Respiratory System	100	NCEA	05/14/93
Copper	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dibenzo(a,h)anthracene	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4,4'-DDE	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4,4'-DDT	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Iron	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lead	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	Chronic	5.01E-05	mg/m^3	1.43E-05	mg/kg-day	CNS	1000/1	IRIS	02/07/02
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Nickel	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2,3,7,8-TCDD	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Thallium	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Vanadium	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

N/A = Not Applicable

(1) Provide equation used for derivation in text.

(2) HEAST, Alternative Methods used as source of barium values.

Chromium and cadmium values were withdrawn from HEAST, but available in Region III RBC Table.

(3) For IRIS values, provide the date IRIS was searched.

For HEAST values, provide the date of HEAST.

For NCEA values, provide the date of the article provided by NCEA.

ATSDR = Agency for Toxic Substances and Disease Registry

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

HEAST(3) = Health Effects Assessment Summary Tables, Alternate Methods

HEAST(4)= Health Effects Assessment Summary Tables, Withdrawn

NCEA = National Center for Environmental Assessment

TABLE 6.1

CANCER TOXICITY DATA -- ORAL/DERMAL

Site 5, St. Juliens Creek

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor	Adjusted Dermal Cancer Slope Factor (1)	Units	EPA Carcinogen Group	Source	Date (2) (MM/DD/YY)
Aluminum	N/A	N/A	N/A	N/A	N/A	NCEA	08/13/99
Antimony	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	1.5E+00	95%	1.5E+00	$(mg/kg\text{-}day)^{-1}$	A	IRIS	03/08/01
Barium	N/A	N/A	N/A	N/A	D	IRIS	03/08/01
Benzo(a)anthracene	7.3E-01	58-89%	7.3E-01	$(mg/kg\text{-}day)^{-1}$	B2	NCEA	07/01/93
Benzo(a)pyrene	7.3E+00	58-89%	7.3E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	03/08/01
Benzo(b)fluoranthene	7.3E-01	58-89%	7.3E-01	$(mg/kg\text{-}day)^{-1}$	B2	NCEA	07/01/93
Cadmium-Water	N/A	N/A	N/A	N/A	B1	IRIS	05/03/03
Cadmium-Food	N/A	N/A	N/A	N/A	B1	IRIS	05/03/03
Chromium (hexavalent)	N/A	N/A	N/A	N/A	D	IRIS	03/08/01
Copper	N/A	N/A	N/A	N/A	D	IRIS	09/05/02
Dibenz(a,h)anthracene	7.3E+00	58-89%	7.3E+00	$(mg/kg\text{-}day)^{-1}$	B2	NCEA	07/01/93
4,4'-DDE	3.4E-01	90%	3.4E-01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	03/29/04
4,4'-DDT	3.4E-01	N/A	3.4E-01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	03/29/04
Indeno(1,2,3-cd)pyrene	7.3E-01	N/A	7.3E-01	$(mg/kg\text{-}day)^{-1}$	B2	NCEA	07/01/93
Iron	N/A	N/A	N/A	N/A	N/A	NCEA	07/23/96
Lead	N/A	N/A	N/A	N/A	B2	IRIS	05/03/03
Manganese (nonfood)	N/A	N/A	N/A	N/A	D	IRIS	03/08/01
Nickel	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2,3,7,8-TCDD*	1.5E+05	50-80%	1.5E+05	$(mg/kg\text{-}day)^{-1}$	B2	HEAST	07/01/97
Thallium	N/A	100%	N/A	N/A	N/A	RBC	04/25/03
Vanadium	N/A	N/A	N/A	N/A	N/A	HEAST	07/01/97
Zinc	N/A	N/A	N/A	N/A	D	IRIS	05/03/03

N/A-Not available

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

NCEA = National Center for Environmental Assessment

U = Under review.

RBC = USEPA Region III Risk-Based Concentration Table

EPA Carcinogen Group:

A - Human carcinogen

B1 - Probable human carcinogen - indicates that limited human data are available

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

C - Possible human carcinogen

D - Not classifiable as a human carcinogen

E - Evidence of noncarcinogenicity

(1) Refer to RAGS, Part E. 2001.

* - 2,3,7,8-TCDD value from *Derivation of Toxicity Values for Dermal Exposure from the Toxicologist* (USEPA, March 1996), Volume 30, Number 1, Part 2.

(2) For IRIS values, provide the date IRIS was searched.

Trichloroethene values available in Region III RBC Table.

For HEAST values, provide the date of HEAST.

For NCEA values, provide article date provided by NCEA.

For RBC values, provide the date of last change in the Tables.

TABLE 6.2

CANCER TOXICITY DATA -- INHALATION

Site 5, St. Juliens Creek

Chemical of Potential Concern	Unit Risk	Units	Adjustment (1)	Inhalation Cancer Slope Factor	Units	Weight of Evidence/ Cancer Guidance Description	Source	Date (2) (MM/DD/YY)
Aluminum	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Antimony	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	4.0E-03	$(ug/m3)^{-1}$	3500	1.5E+01	$(mg/kg\text{-}day)^{-1}$	A	IRIS	06/13/98
Barium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)anthracene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	8.9E-04	$(ug/m3)^{-1}$	3500	3.1E+00	$(mg/kg\text{-}day)^{-1}$	B2	E	1997
Benzo(b)fluoranthene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cadmium	1.8E-03	$(ug/m3)^{-1}$	3500	6.3E+00	$(mg/kg\text{-}day)^{-1}$	B1	IRIS	06/13/98
Chromium (hexavalent)	1.2E-02	$(ug/m3)^{-1}$	3500	4.1E+01	$(mg/kg\text{-}day)^{-1}$	A	IRIS	06/13/98
Copper	N/A	N/A	N/A	N/A	N/A	D	IRIS	09/05/02
Dibenz(a,h)anthracene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4,4'-DDE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4,4'-DDT	9.7E-05	$(ug/m3)^{-1}$	3500	3.4E-01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	03/29/04
Indeno(1,2,3-cd)pyrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Iron	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lead	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Nickel	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2,3,7,8-TCDD*	4.3E+01	$(ug/m3)^{-1}$	3500	1.5E+05	$(mg/kg\text{-}day)^{-1}$	B2	HEAST	07/01/97
Thallium	N/A	N/A	N/A	N/A	N/A	N/A	RBC	04/25/03
Vanadium	N/A	N/A	N/A	N/A	N/A	N/A	HEAST	06/13/05
Zinc	N/A	N/A	N/A	N/A	N/A	D	IRIS	05/03/03

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

NCEA = National Center for Environmental Assessment

U = Under review.

N/A = Not Available

RBC = USEPA Region III Risk-Based Concentration Table

(1) Adjustment Factor applied to Unit Risk to calculate Inhalation Slope Factor = 70kg x 1/20m3/day x 1000ug/mg

(2) For IRIS values, provide the date IRIS was searched.
For HEAST values, provide the date of HEAST.
For NCEA values, provide the date of the article provided by NCEA.
For RBC values, provide the date of last change in the Tables.

EPA Group:

A - Human carcinogen

B1 - Probable human carcinogen - indicates that limited human data are available

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

C - Possible human carcinogen

D - Not classifiable as a human carcinogen

E - Evidence of noncarcinogenicity

Table 7.1
Calculation of Non-Cancer Hazards - RME
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: At Site 5
Receptor Population: Trespasser
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)pyrene	3.1E-01	mg/kg	3.1E-01	mg/kg	M	6.4E-08	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	5.9E-08	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Antimony	1.4E+01	mg/kg	1.4E+01	mg/kg	M	2.8E-06	mg/kg/day	4.0E-04	mg/kg/day	N/A	N/A	7.1E-03
	Arsenic	2.4E+01	mg/kg	2.4E+01	mg/kg	M	4.9E-06	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	1.6E-02
	Barium	3.8E+03	mg/kg	3.8E+03	mg/kg	M	7.6E-04	mg/kg/day	7.0E-02	mg/kg/day	N/A	N/A	1.1E-02
	Chromium	3.5E+01	mg/kg	3.5E+01	mg/kg	M	7.1E-06	mg/kg/day	3.0E-03	mg/kg/day	N/A	N/A	2.4E-03
	Copper	2.7E+04	mg/kg	2.7E+04	mg/kg	M	5.4E-03	mg/kg/day	4.0E-02	mg/kg/day	N/A	N/A	1.4E-01
	Iron	2.6E+04	mg/kg	2.6E+04	mg/kg	M	5.2E-03	mg/kg/day	3.0E-01	mg/kg/day	N/A	N/A	1.7E-02
	Lead	1.4E+03	mg/kg	1.4E+03	mg/kg	M	2.8E-04	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Thallium	1.4E+00	mg/kg	1.4E+00	mg/kg	M	2.9E-07	mg/kg/day	7.0E-05	mg/kg/day	N/A	N/A	4.2E-03
	Zinc	1.4E+04	mg/kg	1.4E+04	mg/kg	M	2.9E-03	mg/kg/day	3.0E-01	mg/kg/day	N/A	N/A	9.7E-03
												Total	2.0E-01
Dermal	Benzo(a)pyrene	3.1E-01	mg/kg	3.1E-01	mg/kg	M	7.9E-08	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	7.3E-08	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Antimony	1.4E+01	mg/kg	1.4E+01	mg/kg	M	2.7E-07	mg/kg/day	6.0E-05	mg/kg/day	N/A	N/A	4.5E-03
	Arsenic	2.4E+01	mg/kg	2.4E+01	mg/kg	M	1.4E-06	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	4.7E-03
	Barium	3.8E+03	mg/kg	3.8E+03	mg/kg	M	7.3E-05	mg/kg/day	4.9E-03	mg/kg/day	N/A	N/A	1.5E-02
	Chromium	3.5E+01	mg/kg	3.5E+01	mg/kg	M	6.8E-07	mg/kg/day	7.5E-05	mg/kg/day	N/A	N/A	9.1E-03
	Copper	2.7E+04	mg/kg	2.7E+04	mg/kg	M	5.1E-04	mg/kg/day	4.0E-02	mg/kg/day	N/A	N/A	1.3E-02
	Iron	2.6E+04	mg/kg	2.6E+04	mg/kg	M	5.0E-04	mg/kg/day	3.0E-01	mg/kg/day	N/A	N/A	1.7E-03
	Lead	1.4E+03	mg/kg	1.4E+03	mg/kg	M	2.7E-05	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Thallium	1.4E+00	mg/kg	1.4E+00	mg/kg	M	2.8E-08	mg/kg/day	7.0E-05	mg/kg/day	N/A	N/A	4.0E-04
	Zinc	1.4E+04	mg/kg	1.4E+04	mg/kg	M	2.8E-04	mg/kg/day	3.0E-01	mg/kg/day	N/A	N/A	9.2E-04
												Total	4.9E-02
												Total Hazard Index Across All Exposure Routes/Pathways	2.5E-01

(1) Medium-Specific (M) EPC selected for hazard calculation.

Table 7.2
Calculation of Non-Cancer Hazards - RME
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: At Site 5
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)pyrene	3.1E-01	mg/kg	3.1E-01	mg/kg	M	8.0E-08	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	7.4E-08	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Antimony	1.4E+01	mg/kg	1.4E+01	mg/kg	M	3.5E-06	mg/kg/day	4.0E-04	mg/kg/day	N/A	N/A	8.9E-03
	Arsenic	2.4E+01	mg/kg	2.4E+01	mg/kg	M	6.2E-06	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	2.1E-02
	Barium	3.8E+03	mg/kg	3.8E+03	mg/kg	M	9.6E-04	mg/kg/day	7.0E-02	mg/kg/day	N/A	N/A	1.4E-02
	Chromium	3.5E+01	mg/kg	3.5E+01	mg/kg	M	8.9E-06	mg/kg/day	3.0E-03	mg/kg/day	N/A	N/A	3.0E-03
	Copper	2.7E+04	mg/kg	2.7E+04	mg/kg	M	6.8E-03	mg/kg/day	4.0E-02	mg/kg/day	N/A	N/A	1.7E-01
	Iron	2.6E+04	mg/kg	2.6E+04	mg/kg	M	6.5E-03	mg/kg/day	3.0E-01	mg/kg/day	N/A	N/A	2.2E-02
	Lead	1.4E+03	mg/kg	1.4E+03	mg/kg	M	3.5E-04	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Thallium	1.4E+00	mg/kg	1.4E+00	mg/kg	M	3.7E-07	mg/kg/day	7.0E-05	mg/kg/day	N/A	N/A	5.2E-03
	Zinc	1.4E+04	mg/kg	1.4E+04	mg/kg	M	3.6E-03	mg/kg/day	3.0E-01	mg/kg/day	N/A	N/A	1.2E-02
												Total	2.5E-01
Dermal	Benzo(a)pyrene	3.1E-01	mg/kg	3.1E-01	mg/kg	M	4.6E-08	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	4.2E-08	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Antimony	1.4E+01	mg/kg	1.4E+01	mg/kg	M	1.6E-07	mg/kg/day	6.0E-05	mg/kg/day	N/A	N/A	2.6E-03
	Arsenic	2.4E+01	mg/kg	2.4E+01	mg/kg	M	8.1E-07	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	2.7E-03
	Barium	3.8E+03	mg/kg	3.8E+03	mg/kg	M	4.2E-05	mg/kg/day	4.9E-03	mg/kg/day	N/A	N/A	8.6E-03
	Chromium	3.5E+01	mg/kg	3.5E+01	mg/kg	M	3.9E-07	mg/kg/day	7.5E-05	mg/kg/day	N/A	N/A	5.2E-03
	Copper	2.7E+04	mg/kg	2.7E+04	mg/kg	M	3.0E-04	mg/kg/day	4.0E-02	mg/kg/day	N/A	N/A	7.5E-03
	Iron	2.6E+04	mg/kg	2.6E+04	mg/kg	M	2.9E-04	mg/kg/day	3.0E-01	mg/kg/day	N/A	N/A	9.6E-04
	Lead	1.4E+03	mg/kg	1.4E+03	mg/kg	M	1.6E-05	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Thallium	1.4E+00	mg/kg	1.4E+00	mg/kg	M	1.6E-08	mg/kg/day	7.0E-05	mg/kg/day	N/A	N/A	2.3E-04
	Zinc	1.4E+04	mg/kg	1.4E+04	mg/kg	M	1.6E-04	mg/kg/day	3.0E-01	mg/kg/day	N/A	N/A	5.3E-04
												Total	2.8E-02
												Total Hazard Index Across All Exposure Routes/Pathways	2.8E-01

(1) Medium-Specific (M) EPC selected for hazard calculation.

Table 7.3
Calculation of Non-Cancer Hazards - RME
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from Surface Soil at Site 5
Receptor Population: Trespasser
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value (1)	Route EPC Units	EPC Selected for Hazard Calculation (2)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Benzo(a)pyrene	3.1E-01	mg/kg	2.4E-10	mg/m^3	R	7.8E-13	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.2E-10	mg/m^3	R	7.2E-13	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Antimony	1.4E+01	mg/kg	1.1E-08	mg/m^3	R	3.4E-11	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Arsenic	2.4E+01	mg/kg	1.8E-08	mg/m^3	R	6.0E-11	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Barium	3.8E+03	mg/kg	2.8E-06	mg/m^3	R	9.3E-09	mg/kg/day	1.4E-04	mg/kg/day	N/A	N/A	6.6E-05
	Chromium	3.5E+01	mg/kg	2.7E-08	mg/m^3	R	8.7E-11	mg/kg/day	3.0E-05	mg/kg/day	N/A	N/A	2.9E-06
	Copper	2.7E+04	mg/kg	2.0E-05	mg/m^3	R	6.6E-08	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Iron	2.6E+04	mg/kg	1.9E-05	mg/m^3	R	6.3E-08	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Lead	1.4E+03	mg/kg	1.0E-06	mg/m^3	R	3.4E-09	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Thallium	1.4E+00	mg/kg	1.1E-09	mg/m^3	R	3.5E-12	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Zinc	1.4E+04	mg/kg	1.1E-05	mg/m^3	R	3.5E-08	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
												Total	6.9E-05
												Total Hazard Index Across All Exposure Routes/Pathways	6.9E-05

(1) Route-specific EPC value is equal to the medium EPC value multilplied by 1/PEF (PEF = 1.32E+09mg3/kg).

(2) Route-Specific (R) EPC selected for hazard calculation.

Table 7.4
Calculation of Non-Cancer Hazards - RME
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from Surface Soil at Site 5
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value (1)	Route EPC Units	EPC Selected for Hazard Calculation (2)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Benzo(a)pyrene	3.1E-01	mg/kg	2.4E-10	mg/m^3	R	8.5E-13	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.2E-10	mg/m^3	R	7.8E-13	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Antimony	1.4E+01	mg/kg	1.1E-08	mg/m^3	R	3.8E-11	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Arsenic	2.4E+01	mg/kg	1.8E-08	mg/m^3	R	6.5E-11	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Barium	3.8E+03	mg/kg	2.8E-06	mg/m^3	R	1.0E-08	mg/kg/day	1.4E-04	mg/kg/day	N/A	N/A	7.2E-05
	Chromium	3.5E+01	mg/kg	2.7E-08	mg/m^3	R	9.5E-11	mg/kg/day	3.0E-05	mg/kg/day	N/A	N/A	3.2E-06
	Copper	2.7E+04	mg/kg	2.0E-05	mg/m^3	R	7.2E-08	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Iron	2.6E+04	mg/kg	1.9E-05	mg/m^3	R	6.9E-08	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Lead	1.4E+03	mg/kg	1.0E-06	mg/m^3	R	3.7E-09	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Thallium	1.4E+00	mg/kg	1.1E-09	mg/m^3	R	3.9E-12	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Zinc	1.4E+04	mg/kg	1.1E-05	mg/m^3	R	3.9E-08	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
												Total	7.6E-05
												Total Hazard Index Across All Exposure Routes/Pathways	7.6E-05

(1) Route-specific EPC value is equal to the medium EPC value multilplied by 1/PEF (PEF = 1.32E+09mg3/kg).
(2) Route-Specific (R) EPC selected for hazard calculation.

Table 7.5
Calculation of Non-Cancer Hazards - RME
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: At Site 5
Receptor Population: Other Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)pyrene	3.1E-01	mg/kg	3.1E-01	mg/kg	M	1.5E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	1.4E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Antimony	1.4E+01	mg/kg	1.4E+01	mg/kg	M	6.8E-06	mg/kg/day	4.0E-04	mg/kg/day	N/A	N/A	1.7E-02
	Arsenic	2.4E+01	mg/kg	2.4E+01	mg/kg	M	1.2E-05	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	4.0E-02
	Barium	3.8E+03	mg/kg	3.8E+03	mg/kg	M	1.8E-03	mg/kg/day	7.0E-02	mg/kg/day	N/A	N/A	2.6E-02
	Chromium	3.5E+01	mg/kg	3.5E+01	mg/kg	M	1.7E-05	mg/kg/day	3.0E-03	mg/kg/day	N/A	N/A	5.7E-03
	Copper	2.7E+04	mg/kg	2.7E+04	mg/kg	M	1.3E-02	mg/kg/day	4.0E-02	mg/kg/day	N/A	N/A	3.3E-01
	Iron	2.6E+04	mg/kg	2.6E+04	mg/kg	M	1.3E-02	mg/kg/day	3.0E-01	mg/kg/day	N/A	N/A	4.2E-02
	Lead	1.4E+03	mg/kg	1.4E+03	mg/kg	M	6.8E-04	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Thallium	1.4E+00	mg/kg	1.4E+00	mg/kg	M	7.0E-07	mg/kg/day	7.0E-05	mg/kg/day	N/A	N/A	1.0E-02
	Zinc	1.4E+04	mg/kg	1.4E+04	mg/kg	M	7.0E-03	mg/kg/day	3.0E-01	mg/kg/day	N/A	N/A	2.3E-02
												Total	4.9E-01
Dermal	Benzo(a)pyrene	3.1E-01	mg/kg	3.1E-01	mg/kg	M	1.4E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	1.3E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Antimony	1.4E+01	mg/kg	1.4E+01	mg/kg	M	4.8E-07	mg/kg/day	6.0E-05	mg/kg/day	N/A	N/A	8.1E-03
	Arsenic	2.4E+01	mg/kg	2.4E+01	mg/kg	M	2.5E-06	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	8.4E-03
	Barium	3.8E+03	mg/kg	3.8E+03	mg/kg	M	1.3E-04	mg/kg/day	4.9E-03	mg/kg/day	N/A	N/A	2.7E-02
	Chromium	3.5E+01	mg/kg	3.5E+01	mg/kg	M	1.2E-06	mg/kg/day	7.5E-05	mg/kg/day	N/A	N/A	1.6E-02
	Copper	2.7E+04	mg/kg	2.7E+04	mg/kg	M	9.2E-04	mg/kg/day	4.0E-02	mg/kg/day	N/A	N/A	2.3E-02
	Iron	2.6E+04	mg/kg	2.6E+04	mg/kg	M	8.9E-04	mg/kg/day	3.0E-01	mg/kg/day	N/A	N/A	3.0E-03
	Lead	1.4E+03	mg/kg	1.4E+03	mg/kg	M	#REF!	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Thallium	1.4E+00	mg/kg	1.4E+00	mg/kg	M	5.0E-08	mg/kg/day	7.0E-05	mg/kg/day	N/A	N/A	7.1E-04
	Zinc	1.4E+04	mg/kg	1.4E+04	mg/kg	M	5.0E-04	mg/kg/day	3.0E-01	mg/kg/day	N/A	N/A	1.7E-03
												Total	8.8E-02
												Total Hazard Index Across All Exposure Routes/Pathways	5.8E-01

(1) Medium-Specific (M) EPC selected for hazard calculation.

Table 7.7
Calculation of Non-Cancer Hazards - RME
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: At Site 5
Receptor Population: Resident
Receptor Age: Adul

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake Non-Cancer	Intake Non-Cance Units	Reference Dose	Reference Dose Units	Reference oncentratio	Reference oncentratio Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	3.4E-01	mg/kg	3.4E-01	mg/kg	M	4.6E-07	mg/kg/day	N/A	mg/kg/da	N/A	N/A	N/A
	Benzo(a)pyrene	3.1E-01	mg/kg	3.1E-01	mg/kg	M	4.3E-07	mg/kg/day	N/A	mg/kg/da	N/A	N/A	N/A
	Benzo(b)fluoranthene	9.4E-01	mg/kg	9.4E-01	mg/kg	M	1.3E-06	mg/kg/day	N/A	mg/kg/da	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	4.0E-07	mg/kg/day	N/A	mg/kg/da	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	4.0E-07	mg/kg/day	N/A	mg/kg/da	N/A	N/A	N/A
	4,4'-DDE	1.1E+00	mg/kg	1.1E+00	mg/kg	M	1.4E-06	mg/kg/day	NA	mg/kg/da	N/A	N/A	N/A
	4,4'-DDT	3.8E-01	mg/kg	3.8E-01	mg/kg	M	5.2E-07	mg/kg/day	5.0E-04	mg/kg/da	N/A	N/A	1.0E-03
	2,3,7,8-TCDD (dioxin equival	2.1E-05	mg/kg	2.1E-05	mg/kg	M	2.9E-11	mg/kg/day	N/A	mg/kg/da	N/A	N/A	N/A
	Aluminum	1.2E+04	mg/kg	1.2E+04	mg/kg	M	1.6E-02	mg/kg/day	1.0E+00	mg/kg/da	N/A	N/A	1.6E-02
	Antimony	1.4E+01	mg/kg	1.4E+01	mg/kg	M	1.9E-05	mg/kg/day	4.0E-04	mg/kg/da	N/A	N/A	4.8E-02
	Arsenic	2.4E+01	mg/kg	2.4E+01	mg/kg	M	3.3E-05	mg/kg/day	3.0E-04	mg/kg/da	N/A	N/A	1.1E-01
	Barium	3.8E+03	mg/kg	3.8E+03	mg/kg	M	5.1E-03	mg/kg/day	7.0E-02	mg/kg/da	N/A	N/A	7.3E-02
	Cadmium	4.2E+00	mg/kg	4.2E+00	mg/kg	M	5.8E-06	mg/kg/day	1.0E-03	mg/kg/da	N/A	N/A	5.8E-03
	Chromium	3.5E+01	mg/kg	3.5E+01	mg/kg	M	4.8E-05	mg/kg/day	3.0E-03	mg/kg/da	N/A	N/A	1.6E-02
	Copper	2.7E+04	mg/kg	2.7E+04	mg/kg	M	3.6E-02	mg/kg/day	4.0E-02	mg/kg/da	N/A	N/A	9.1E-01
	Iron	2.6E+04	mg/kg	2.6E+04	mg/kg	M	3.5E-02	mg/kg/day	3.0E-01	mg/kg/da	N/A	N/A	1.2E-01
	Lead	1.4E+03	mg/kg	1.4E+03	mg/kg	M	1.9E-03	mg/kg/day	N/A	mg/kg/da	N/A	N/A	N/A
	Manganese	2.6E+02	mg/kg	2.6E+02	mg/kg	M	3.6E-04	mg/kg/day	2.0E-02	mg/kg/da	N/A	N/A	1.8E-02
	Nickel	3.1E+01	mg/kg	3.1E+01	mg/kg	M	4.2E-05	mg/kg/day	2.0E-02	mg/kg/da	N/A	N/A	2.1E-03
	Thallium	1.4E+00	mg/kg	1.4E+00	mg/kg	M	2.0E-06	mg/kg/day	7.0E-05	mg/kg/da	N/A	N/A	2.8E-02
	Vanadium	3.3E+01	mg/kg	3.3E+01	mg/kg	M	4.5E-05	mg/kg/day	1.0E-03	mg/kg/da	N/A	N/A	4.5E-02
	Zinc	1.4E+04	mg/kg	1.4E+04	mg/kg	M	2.0E-02	mg/kg/day	3.0E-01	mg/kg/da	N/A	N/A	6.5E-02
												Total	1.5E+00
Dermal	Benzo(a)anthracene	3.4E-01	mg/kg	3.4E-01	mg/kg	M	5.7E-07	mg/kg/day	N/A	mg/kg/da	N/A	N/A	N/A
	Benzo(a)pyrene	3.1E-01	mg/kg	3.1E-01	mg/kg	M	5.3E-07	mg/kg/day	N/A	mg/kg/da	N/A	N/A	N/A
	Benzo(b)fluoranthene	9.4E-01	mg/kg	9.4E-01	mg/kg	M	1.6E-06	mg/kg/day	N/A	mg/kg/da	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	4.9E-07	mg/kg/day	N/A	mg/kg/da	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	5.0E-07	mg/kg/day	N/A	mg/kg/da	N/A	N/A	N/A
	4,4'-DDE	1.1E+00	mg/kg	1.1E+00	mg/kg	M	1.4E-06	mg/kg/day	NA	mg/kg/da	N/A	N/A	N/A
	4,4'-DDT	3.8E-01	mg/kg	3.8E-01	mg/kg	M	1.5E-07	mg/kg/day	5.0E-04	mg/kg/da	N/A	N/A	2.9E-04
	2,3,7,8-TCDD (dioxin equival	2.1E-05	mg/kg	2.1E-05	mg/kg	M	8.2E-12	mg/kg/day	N/A	mg/kg/da	N/A	N/A	N/A
	Aluminum	1.2E+04	mg/kg	1.2E+04	mg/kg	M	1.5E-03	mg/kg/day	1.0E+00	mg/kg/da	N/A	N/A	1.5E-03
	Antimony	1.4E+01	mg/kg	1.4E+01	mg/kg	M	1.8E-06	mg/kg/day	6.0E-05	mg/kg/da	N/A	N/A	3.0E-02
	Arsenic	2.4E+01	mg/kg	2.4E+01	mg/kg	M	9.5E-06	mg/kg/day	3.0E-04	mg/kg/da	N/A	N/A	3.2E-02
	Barium	3.8E+03	mg/kg	3.8E+03	mg/kg	M	4.9E-04	mg/kg/day	4.9E-03	mg/kg/da	N/A	N/A	1.0E-01
	Cadmium	4.2E+00	mg/kg	4.2E+00	mg/kg	M	5.5E-08	mg/kg/day	2.5E-05	mg/kg/da	N/A	N/A	2.2E-03
	Chromium	3.5E+01	mg/kg	3.5E+01	mg/kg	M	4.6E-06	mg/kg/day	7.5E-05	mg/kg/da	N/A	N/A	6.1E-02
	Copper	2.7E+04	mg/kg	2.7E+04	mg/kg	M	3.5E-03	mg/kg/day	4.0E-02	mg/kg/da	N/A	N/A	8.7E-02
	Iron	2.6E+04	mg/kg	2.6E+04	mg/kg	M	3.3E-03	mg/kg/day	3.0E-01	mg/kg/da	N/A	N/A	1.1E-02
	Lead	1.4E+03	mg/kg	1.4E+03	mg/kg	M	1.8E-04	mg/kg/day	N/A	mg/kg/da	N/A	N/A	N/A
	Manganese	2.6E+02	mg/kg	2.6E+02	mg/kg	M	3.4E-05	mg/kg/day	8.0E-04	mg/kg/da	N/A	N/A	4.3E-02
	Nickel	3.1E+01	mg/kg	3.1E+01	mg/kg	M	4.0E-06	mg/kg/day	8.0E-04	mg/kg/da	N/A	N/A	5.0E-03
	Thallium	1.4E+00	mg/kg	1.4E+00	mg/kg	M	1.9E-07	mg/kg/day	7.0E-05	mg/kg/da	N/A	N/A	2.7E-03
	Vanadium	3.3E+01	mg/kg	3.3E+01	mg/kg	M	4.3E-06	mg/kg/day	2.6E-05	mg/kg/da	N/A	N/A	1.6E-01
	Zinc	1.4E+04	mg/kg	1.4E+04	mg/kg	M	1.9E-03	mg/kg/day	3.0E-01	mg/kg/da	N/A	N/A	6.2E-03
												Total	5.4E-01

Table 7.8
Calculation of Non-Cancer Hazards - RME
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: At Site 5
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	3.4E-01	mg/kg	3.4E-01	mg/kg	M	4.3E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Benzo(a)pyrene	3.1E-01	mg/kg	3.1E-01	mg/kg	M	4.0E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Benzo(b)fluoranthene	9.4E-01	mg/kg	9.4E-01	mg/kg	M	1.2E-05	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	3.7E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	3.8E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	4,4'-DDE	1.1E+00	mg/kg	1.1E+00	mg/kg	M	1.3E-05	mg/kg/day	NA	mg/kg/day	N/A	N/A	N/A
	4,4'-DDT	3.8E-01	mg/kg	3.8E-01	mg/kg	M	4.8E-06	mg/kg/day	5.0E-04	mg/kg/day	N/A	N/A	9.7E-03
	2,3,7,8-TCDD (dioxin equivalent)	2.1E-05	mg/kg	2.1E-05	mg/kg	M	2.7E-10	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Aluminum	1.2E+04	mg/kg	1.2E+04	mg/kg	M	1.5E-01	mg/kg/day	1.0E+00	mg/kg/day	N/A	N/A	1.5E-01
	Antimony	1.4E+01	mg/kg	1.4E+01	mg/kg	M	1.8E-04	mg/kg/day	4.0E-04	mg/kg/day	N/A	N/A	4.5E-01
	Arsenic	2.4E+01	mg/kg	2.4E+01	mg/kg	M	3.1E-04	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	1.0E+00
	Barium	3.8E+03	mg/kg	3.8E+03	mg/kg	M	4.8E-02	mg/kg/day	7.0E-02	mg/kg/day	N/A	N/A	6.9E-01
	Cadmium	4.2E+00	mg/kg	4.2E+00	mg/kg	M	5.4E-05	mg/kg/day	1.0E-03	mg/kg/day	N/A	N/A	5.4E-02
	Chromium	3.5E+01	mg/kg	3.5E+01	mg/kg	M	4.5E-04	mg/kg/day	3.0E-03	mg/kg/day	N/A	N/A	1.5E-01
	Copper	2.7E+04	mg/kg	2.7E+04	mg/kg	M	3.4E-01	mg/kg/day	4.0E-02	mg/kg/day	N/A	N/A	8.5E+00
	Iron	2.6E+04	mg/kg	2.6E+04	mg/kg	M	3.3E-01	mg/kg/day	3.0E-01	mg/kg/day	N/A	N/A	1.1E+00
	Lead	1.4E+03	mg/kg	1.4E+03	mg/kg	M	1.8E-02	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Manganese	2.6E+02	mg/kg	2.6E+02	mg/kg	M	3.4E-03	mg/kg/day	2.0E-02	mg/kg/day	N/A	N/A	1.7E-01
	Nickel	3.1E+01	mg/kg	3.1E+01	mg/kg	M	3.9E-04	mg/kg/day	2.0E-02	mg/kg/day	N/A	N/A	2.0E-02
	Thallium	1.4E+00	mg/kg	1.4E+00	mg/kg	M	1.8E-05	mg/kg/day	7.0E-05	mg/kg/day	N/A	N/A	2.6E-01
	Vanadium	3.3E+01	mg/kg	3.3E+01	mg/kg	M	4.2E-04	mg/kg/day	1.0E-03	mg/kg/day	N/A	N/A	4.2E-01
	Zinc	1.4E+04	mg/kg	1.4E+04	mg/kg	M	1.8E-01	mg/kg/day	3.0E-01	mg/kg/day	N/A	N/A	6.1E-01
												Total	1.4E+01
Dermal	Benzo(a)anthracene	3.4E-01	mg/kg	3.4E-01	mg/kg	M	1.1E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Benzo(a)pyrene	3.1E-01	mg/kg	3.1E-01	mg/kg	M	1.0E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Benzo(b)fluoranthene	9.4E-01	mg/kg	9.4E-01	mg/kg	M	3.1E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	9.6E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	9.7E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	4,4'-DDE	1.1E+00	mg/kg	1.1E+00	mg/kg	M	2.7E-06	mg/kg/day	NA	mg/kg/day	N/A	N/A	N/A
	4,4'-DDT	3.8E-01	mg/kg	3.8E-01	mg/kg	M	2.9E-07	mg/kg/day	5.0E-04	mg/kg/day	N/A	N/A	5.7E-04
	2,3,7,8-TCDD (dioxin equivalent)	2.1E-05	mg/kg	2.1E-05	mg/kg	M	1.6E-11	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Aluminum	1.2E+04	mg/kg	1.2E+04	mg/kg	M	3.0E-03	mg/kg/day	1.0E+00	mg/kg/day	N/A	N/A	3.0E-03
	Antimony	1.4E+01	mg/kg	1.4E+01	mg/kg	M	3.5E-06	mg/kg/day	6.0E-05	mg/kg/day	N/A	N/A	5.9E-02

Table 7.8
Calculation of Non-Cancer Hazards - RME
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: At Site 5
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
	Arsenic	2.4E+01	mg/kg	2.4E+01	mg/kg	M	1.8E-05	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	6.1E-02
	Barium	3.8E+03	mg/kg	3.8E+03	mg/kg	M	9.5E-04	mg/kg/day	4.9E-03	mg/kg/day	N/A	N/A	1.9E-01
	Cadmium	4.2E+00	mg/kg	4.2E+00	mg/kg	M	1.1E-07	mg/kg/day	2.5E-05	mg/kg/day	N/A	N/A	4.3E-03
	Chromium	3.5E+01	mg/kg	3.5E+01	mg/kg	M	8.9E-06	mg/kg/day	7.5E-05	mg/kg/day	N/A	N/A	1.2E-01
	Copper	2.7E+04	mg/kg	2.7E+04	mg/kg	M	6.7E-03	mg/kg/day	4.0E-02	mg/kg/day	N/A	N/A	1.7E-01
	Iron	2.6E+04	mg/kg	2.6E+04	mg/kg	M	6.5E-03	mg/kg/day	3.0E-01	mg/kg/day	N/A	N/A	2.2E-02
	Lead	1.4E+03	mg/kg	1.4E+03	mg/kg	M	3.5E-04	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Manganese	2.6E+02	mg/kg	2.6E+02	mg/kg	M	6.6E-05	mg/kg/day	8.0E-04	mg/kg/day	N/A	N/A	8.3E-02
	Nickel	3.1E+01	mg/kg	3.1E+01	mg/kg	M	7.8E-06	mg/kg/day	8.0E-04	mg/kg/day	N/A	N/A	9.7E-03
	Thallium	1.4E+00	mg/kg	1.4E+00	mg/kg	M	3.6E-07	mg/kg/day	7.0E-05	mg/kg/day	N/A	N/A	5.2E-03
	Vanadium	3.3E+01	mg/kg	3.3E+01	mg/kg	M	8.3E-06	mg/kg/day	2.6E-05	mg/kg/day	N/A	N/A	3.2E-01
	Zinc	1.4E+04	mg/kg	1.4E+04	mg/kg	M	3.6E-03	mg/kg/day	3.0E-01	mg/kg/day	N/A	N/A	1.2E-02
												Total	1.1E+00
												Total Hazard Index Across All Exposure Routes/Pathways	1.5E+01

(1) Medium-Specific (M) EPC selected for hazard calculation.

Table 7.9
Calculation of Non-Cancer Hazards - CT
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: At Site 5
Receptor Population: Resident
Receptor Age: Adul

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake Non-Cancer	Intake Non-Cance Units	Reference Dose	Reference Dose Units	Reference oncentratio	Reference oncentratio Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	3.4E-01	mg/kg	3.4E-01	mg/kg	M	1.5E-07	mg/kg/day	N/A	mg/kg/da	N/A	N/A	N/A
	Benzo(a)pyrene	3.1E-01	mg/kg	3.1E-01	mg/kg	M	1.4E-07	mg/kg/day	N/A	mg/kg/da	N/A	N/A	N/A
	Benzo(b)fluoranthene	9.4E-01	mg/kg	9.4E-01	mg/kg	M	4.3E-07	mg/kg/day	N/A	mg/kg/da	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	1.3E-07	mg/kg/day	N/A	mg/kg/da	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	1.3E-07	mg/kg/day	N/A	mg/kg/da	N/A	N/A	N/A
	4,4'-DDE	1.1E+00	mg/kg	1.1E+00	mg/kg	M	4.8E-07	mg/kg/day	NA	mg/kg/da	N/A	N/A	N/A
	4,4'-DDT	3.8E-01	mg/kg	3.8E-01	mg/kg	M	1.7E-07	mg/kg/day	5.0E-04	mg/kg/da	N/A	N/A	3.5E-04
	2,3,7,8-TCDD (dioxin equival	2.1E-05	mg/kg	2.1E-05	mg/kg	M	9.6E-12	mg/kg/day	N/A	mg/kg/da	N/A	N/A	N/A
	Aluminum	1.2E+04	mg/kg	1.2E+04	mg/kg	M	5.3E-03	mg/kg/day	1.0E+00	mg/kg/da	N/A	N/A	5.3E-03
	Antimony	1.4E+01	mg/kg	1.4E+01	mg/kg	M	6.4E-06	mg/kg/day	4.0E-04	mg/kg/da	N/A	N/A	1.6E-02
	Arsenic	2.4E+01	mg/kg	2.4E+01	mg/kg	M	1.1E-05	mg/kg/day	3.0E-04	mg/kg/da	N/A	N/A	3.7E-02
	Barium	3.8E+03	mg/kg	3.8E+03	mg/kg	M	1.7E-03	mg/kg/day	7.0E-02	mg/kg/da	N/A	N/A	2.5E-02
	Cadmium	4.2E+00	mg/kg	4.2E+00	mg/kg	M	1.9E-06	mg/kg/day	1.0E-03	mg/kg/da	N/A	N/A	1.9E-03
	Chromium	3.5E+01	mg/kg	3.5E+01	mg/kg	M	1.6E-05	mg/kg/day	3.0E-03	mg/kg/da	N/A	N/A	5.4E-03
	Copper	2.7E+04	mg/kg	2.7E+04	mg/kg	M	1.2E-02	mg/kg/day	4.0E-02	mg/kg/da	N/A	N/A	3.0E-01
	Iron	2.6E+04	mg/kg	2.6E+04	mg/kg	M	1.2E-02	mg/kg/day	3.0E-01	mg/kg/da	N/A	N/A	3.9E-02
	Lead	1.4E+03	mg/kg	1.4E+03	mg/kg	M	6.3E-04	mg/kg/day	N/A	mg/kg/da	N/A	N/A	N/A
	Manganese	2.6E+02	mg/kg	2.6E+02	mg/kg	M	1.2E-04	mg/kg/day	2.0E-02	mg/kg/da	N/A	N/A	6.0E-03
	Nickel	3.1E+01	mg/kg	3.1E+01	mg/kg	M	1.4E-05	mg/kg/day	2.0E-02	mg/kg/da	N/A	N/A	7.0E-04
	Thallium	1.4E+00	mg/kg	1.4E+00	mg/kg	M	6.6E-07	mg/kg/day	7.0E-05	mg/kg/da	N/A	N/A	9.4E-03
	Vanadium	3.3E+01	mg/kg	3.3E+01	mg/kg	M	1.5E-05	mg/kg/day	1.0E-03	mg/kg/da	N/A	N/A	1.5E-02
	Zinc	1.4E+04	mg/kg	1.4E+04	mg/kg	M	6.5E-03	mg/kg/da	3.0E-01	mg/kg/da	N/A	N/A	2.2E-02
												Total	4.9E-01
Dermal	Benzo(a)anthracene	3.4E-01	mg/kg	3.4E-01	mg/kg	M	7.6E-08	mg/kg/day	N/A	mg/kg/da	N/A	N/A	N/A
	Benzo(a)pyrene	3.1E-01	mg/kg	3.1E-01	mg/kg	M	7.1E-08	mg/kg/day	N/A	mg/kg/da	N/A	N/A	N/A
	Benzo(b)fluoranthene	9.4E-01	mg/kg	9.4E-01	mg/kg	M	2.1E-07	mg/kg/day	N/A	mg/kg/da	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	6.6E-08	mg/kg/day	N/A	mg/kg/da	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	6.7E-08	mg/kg/day	N/A	mg/kg/da	N/A	N/A	N/A
	4,4'-DDE	1.1E+00	mg/kg	1.1E+00	mg/kg	M	1.8E-07	mg/kg/day	NA	mg/kg/da	N/A	N/A	N/A
	4,4'-DDT	3.8E-01	mg/kg	3.8E-01	mg/kg	M	2.0E-08	mg/kg/day	5.0E-04	mg/kg/da	N/A	N/A	3.9E-05
	2,3,7,8-TCDD (dioxin equival	2.1E-05	mg/kg	2.1E-05	mg/kg	M	1.1E-12	mg/kg/day	N/A	mg/kg/da	N/A	N/A	N/A
	Aluminum	1.2E+04	mg/kg	1.2E+04	mg/kg	M	2.0E-04	mg/kg/day	1.0E+00	mg/kg/da	N/A	N/A	2.0E-04
	Antimony	1.4E+01	mg/kg	1.4E+01	mg/kg	M	2.4E-07	mg/kg/da	6.0E-05	mg/kg/da	N/A	N/A	4.0E-03
	Arsenic	2.4E+01	mg/kg	2.4E+01	mg/kg	M	1.3E-06	mg/kg/day	3.0E-04	mg/kg/da	N/A	N/A	4.2E-03
	Barium	3.8E+03	mg/kg	3.8E+03	mg/kg	M	6.5E-05	mg/kg/day	4.9E-03	mg/kg/da	N/A	N/A	1.3E-02
	Cadmium	4.2E+00	mg/kg	4.2E+00	mg/kg	M	7.3E-09	mg/kg/day	2.5E-05	mg/kg/da	N/A	N/A	2.9E-04
	Chromium	3.5E+01	mg/kg	3.5E+01	mg/kg	M	6.1E-07	mg/kg/day	7.5E-05	mg/kg/da	N/A	N/A	8.1E-03
	Copper	2.7E+04	mg/kg	2.7E+04	mg/kg	M	4.6E-04	mg/kg/day	4.0E-02	mg/kg/da	N/A	N/A	1.2E-02
	Iron	2.6E+04	mg/kg	2.6E+04	mg/kg	M	4.5E-04	mg/kg/day	3.0E-01	mg/kg/da	N/A	N/A	1.5E-03
	Lead	1.4E+03	mg/kg	1.4E+03	mg/kg	M	2.4E-05	mg/kg/day	N/A	mg/kg/da	N/A	N/A	N/A
	Manganese	2.6E+02	mg/kg	2.6E+02	mg/kg	M	4.6E-06	mg/kg/day	8.0E-04	mg/kg/da	N/A	N/A	5.7E-03
	Nickel	3.1E+01	mg/kg	3.1E+01	mg/kg	M	5.4E-07	mg/kg/day	8.0E-04	mg/kg/da	N/A	N/A	6.7E-04
	Thallium	1.4E+00	mg/kg	1.4E+00	mg/kg	M	2.5E-08	mg/kg/day	7.0E-05	mg/kg/da	N/A	N/A	3.6E-04
	Vanadium	3.3E+01	mg/kg	3.3E+01	mg/kg	M	5.7E-07	mg/kg/day	2.6E-05	mg/kg/da	N/A	N/A	2.2E-02
	Zinc	1.4E+04	mg/kg	1.4E+04	mg/kg	M	2.5E-04	mg/kg/da	3.0E-01	mg/kg/da	N/A	N/A	8.3E-04
												Total	7.3E-02

Table 7.10
Calculation of Non-Cancer Hazards - CT
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: At Site 5
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake Non-Cancer	Intake Non-Cancer Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	3.4E-01	mg/kg	3.4E-01	mg/kg	M	1.4E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Benzo(a)pyrene	3.1E-01	mg/kg	3.1E-01	mg/kg	M	1.3E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Benzo(b)fluoranthene	9.4E-01	mg/kg	9.4E-01	mg/kg	M	4.0E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	1.2E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	1.3E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	4,4'-DDE	1.1E+00	mg/kg	1.1E+00	mg/kg	M	4.5E-06	mg/kg/day	NA	mg/kg/day	N/A	N/A	N/A
	4,4'-DDT	3.8E-01	mg/kg	3.8E-01	mg/kg	M	1.6E-06	mg/kg/day	5.0E-04	mg/kg/day	N/A	N/A	3.2E-03
	2,3,7,8-TCDD (dioxin equiva	2.1E-05	mg/kg	2.1E-05	mg/kg	M	9.0E-11	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Aluminum	1.2E+04	mg/kg	1.2E+04	mg/kg	M	5.0E-02	mg/kg/day	1.0E+00	mg/kg/day	N/A	N/A	5.0E-02
	Antimony	1.4E+01	mg/kg	1.4E+01	mg/kg	M	6.0E-05	mg/kg/day	4.0E-04	mg/kg/day	N/A	N/A	1.5E-01
	Arsenic	2.4E+01	mg/kg	2.4E+01	mg/kg	M	1.0E-04	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	3.5E-01
	Barium	3.8E+03	mg/kg	3.8E+03	mg/kg	M	1.6E-02	mg/kg/day	7.0E-02	mg/kg/day	N/A	N/A	2.3E-01
	Cadmium	4.2E+00	mg/kg	4.2E+00	mg/kg	M	1.8E-05	mg/kg/day	1.0E-03	mg/kg/day	N/A	N/A	1.8E-02
	Chromium	3.5E+01	mg/kg	3.5E+01	mg/kg	M	1.5E-04	mg/kg/day	3.0E-03	mg/kg/day	N/A	N/A	5.0E-02
	Copper	2.7E+04	mg/kg	2.7E+04	mg/kg	M	1.1E-01	mg/kg/day	4.0E-02	mg/kg/day	N/A	N/A	2.8E+00
	Iron	2.6E+04	mg/kg	2.6E+04	mg/kg	M	1.1E-01	mg/kg/day	3.0E-01	mg/kg/day	N/A	N/A	3.7E-01
	Lead	1.4E+03	mg/kg	1.4E+03	mg/kg	M	5.9E-03	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Manganese	2.6E+02	mg/kg	2.6E+02	mg/kg	M	1.1E-03	mg/kg/day	2.0E-02	mg/kg/day	N/A	N/A	5.6E-02
	Nickel	3.1E+01	mg/kg	3.1E+01	mg/kg	M	1.3E-04	mg/kg/day	2.0E-02	mg/kg/day	N/A	N/A	6.6E-03
	Thallium	1.4E+00	mg/kg	1.4E+00	mg/kg	M	6.1E-06	mg/kg/day	7.0E-05	mg/kg/day	N/A	N/A	8.8E-02
	Vanadium	3.3E+01	mg/kg	3.3E+01	mg/kg	M	1.4E-04	mg/kg/day	1.0E-03	mg/kg/day	N/A	N/A	1.4E-01
	Zinc	1.4E+04	mg/kg	1.4E+04	mg/kg	M	6.1E-02	mg/kg/day	3.0E-01	mg/kg/day	N/A	N/A	2.0E-01
												Total	4.5E+00
Dermal	Benzo(a)anthracene	3.4E-01	mg/kg	3.4E-01	mg/kg	M	1.8E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Benzo(a)pyrene	3.1E-01	mg/kg	3.1E-01	mg/kg	M	1.7E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Benzo(b)fluoranthene	9.4E-01	mg/kg	9.4E-01	mg/kg	M	5.0E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	1.5E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	1.6E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	4,4'-DDE	1.1E+00	mg/kg	1.1E+00	mg/kg	M	4.3E-07	mg/kg/day	NA	mg/kg/day	N/A	N/A	N/A
	4,4'-DDT	3.8E-01	mg/kg	3.8E-01	mg/kg	M	4.6E-08	mg/kg/day	5.0E-04	mg/kg/day	N/A	N/A	9.2E-05
	2,3,7,8-TCDD (dioxin equiva	2.1E-05	mg/kg	2.1E-05	mg/kg	M	2.6E-12	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Aluminum	1.2E+04	mg/kg	1.2E+04	mg/kg	M	4.7E-04	mg/kg/day	1.0E+00	mg/kg/day	N/A	N/A	4.7E-04
	Antimony	1.4E+01	mg/kg	1.4E+01	mg/kg	M	5.7E-07	mg/kg/day	6.0E-05	mg/kg/day	N/A	N/A	9.4E-03
	Arsenic	2.4E+01	mg/kg	2.4E+01	mg/kg	M	3.0E-06	mg/kg/day	3.0E-04	mg/kg/day	N/A	N/A	9.9E-03
	Barium	3.8E+03	mg/kg	3.8E+03	mg/kg	M	1.5E-04	mg/kg/day	4.9E-03	mg/kg/day	N/A	N/A	3.1E-02
	Cadmium	4.2E+00	mg/kg	4.2E+00	mg/kg	M	1.7E-08	mg/kg/day	2.5E-05	mg/kg/day	N/A	N/A	6.8E-04
	Chromium	3.5E+01	mg/kg	3.5E+01	mg/kg	M	1.4E-06	mg/kg/day	7.5E-05	mg/kg/day	N/A	N/A	1.9E-02
	Copper	2.7E+04	mg/kg	2.7E+04	mg/kg	M	1.1E-03	mg/kg/day	4.0E-02	mg/kg/day	N/A	N/A	2.7E-02
	Iron	2.6E+04	mg/kg	2.6E+04	mg/kg	M	1.0E-03	mg/kg/day	3.0E-01	mg/kg/day	N/A	N/A	3.5E-03
	Lead	1.4E+03	mg/kg	1.4E+03	mg/kg	M	5.6E-05	mg/kg/day	N/A	mg/kg/day	N/A	N/A	N/A
	Manganese	2.6E+02	mg/kg	2.6E+02	mg/kg	M	1.1E-05	mg/kg/day	8.0E-04	mg/kg/day	N/A	N/A	1.3E-02
	Nickel	3.1E+01	mg/kg	3.1E+01	mg/kg	M	1.3E-06	mg/kg/day	8.0E-04	mg/kg/day	N/A	N/A	1.6E-03
	Thallium	1.4E+00	mg/kg	1.4E+00	mg/kg	M	5.8E-08	mg/kg/day	7.0E-05	mg/kg/day	N/A	N/A	8.3E-04
	Vanadium	3.3E+01	mg/kg	3.3E+01	mg/kg	M	1.3E-06	mg/kg/day	2.6E-05	mg/kg/day	N/A	N/A	5.1E-02
	Zinc	1.4E+04	mg/kg	1.4E+04	mg/kg	M	5.8E-04	mg/kg/day	3.0E-01	mg/kg/day	N/A	N/A	1.9E-03
												Total	1.7E-01

Table 8.1
Calculation of Cancer Risks - RME
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: At Site 5
Receptor Population: Trespasser
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)pyrene	3.1E-01	mg/kg	3.1E-01	mg/kg	M	2.7E-08	1/mg/kg/day	7.3E+00	1/mg/kg/day	2.0E-07
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	2.5E-08	1/mg/kg/day	7.3E+00	1/mg/kg/day	1.8E-07
	Antimony	1.4E+01	mg/kg	1.4E+01	mg/kg	M	1.2E-06	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Arsenic	2.4E+01	mg/kg	2.4E+01	mg/kg	M	2.1E-06	1/mg/kg/day	1.5E+00	1/mg/kg/day	3.2E-06
	Barium	3.8E+03	mg/kg	3.8E+03	mg/kg	M	3.3E-04	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Chromium	3.5E+01	mg/kg	3.5E+01	mg/kg	M	3.1E-06	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Copper	2.7E+04	mg/kg	2.7E+04	mg/kg	M	2.3E-03	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Iron	2.6E+04	mg/kg	2.6E+04	mg/kg	M	2.2E-03	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Lead	1.4E+03	mg/kg	1.4E+03	mg/kg	M	1.2E-04	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Thallium	1.4E+00	mg/kg	1.4E+00	mg/kg	M	1.3E-07	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Zinc	1.4E+04	mg/kg	1.4E+04	mg/kg	M	1.2E-03	1/mg/kg/day	N/A	1/mg/kg/day	N/A
										Total	3.6E-06
Dermal	Benzo(a)pyrene	3.1E-01	mg/kg	3.1E-01	mg/kg	M	3.4E-08	1/mg/kg/day	7.3E+00	1/mg/kg/day	2.5E-07
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	3.1E-08	1/mg/kg/day	7.3E+00	1/mg/kg/day	2.3E-07
	Antimony	1.4E+01	mg/kg	1.4E+01	mg/kg	M	1.2E-07	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Arsenic	2.4E+01	mg/kg	2.4E+01	mg/kg	M	6.0E-07	1/mg/kg/day	1.5E+00	1/mg/kg/day	9.0E-07
	Barium	3.8E+03	mg/kg	3.8E+03	mg/kg	M	3.1E-05	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Chromium	3.5E+01	mg/kg	3.5E+01	mg/kg	M	2.9E-07	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Copper	2.7E+04	mg/kg	2.7E+04	mg/kg	M	2.2E-04	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Iron	2.6E+04	mg/kg	2.6E+04	mg/kg	M	2.1E-04	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Lead	1.4E+03	mg/kg	1.4E+03	mg/kg	M	1.1E-05	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Thallium	1.4E+00	mg/kg	1.4E+00	mg/kg	M	1.2E-08	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Zinc	1.4E+04	mg/kg	1.4E+04	mg/kg	M	1.2E-04	1/mg/kg/day	NA	1/mg/kg/day	N/A
										Total	1.4E-06
										Total Risk Across All Exposure Routes/Pathways	4.9E-06

(1) Medium-Specific (M) EPC selected for hazard calculation.

Table 8.2
Calculation of Cancer Risks - RME
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: At Site 5
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)pyrene	3.1E-01	mg/kg	3.1E-01	mg/kg	M	6.9E-09	1/mg/kg/day	7.3E+00	1/mg/kg/day	5.0E-08
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	6.3E-09	1/mg/kg/day	7.3E+00	1/mg/kg/day	4.6E-08
	Antimony	1.4E+01	mg/kg	1.4E+01	mg/kg	M	3.0E-07	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Arsenic	2.4E+01	mg/kg	2.4E+01	mg/kg	M	5.3E-07	1/mg/kg/day	1.5E+00	1/mg/kg/day	7.9E-07
	Barium	3.8E+03	mg/kg	3.8E+03	mg/kg	M	8.2E-05	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Chromium	3.5E+01	mg/kg	3.5E+01	mg/kg	M	7.7E-07	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Copper	2.7E+04	mg/kg	2.7E+04	mg/kg	M	5.8E-04	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Iron	2.6E+04	mg/kg	2.6E+04	mg/kg	M	5.6E-04	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Lead	1.4E+03	mg/kg	1.4E+03	mg/kg	M	3.0E-05	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Thallium	1.4E+00	mg/kg	1.4E+00	mg/kg	M	3.1E-08	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Zinc	1.4E+04	mg/kg	1.4E+04	mg/kg	M	3.1E-04	1/mg/kg/day	N/A	1/mg/kg/day	N/A
										Total	8.9E-07
Dermal	Benzo(a)pyrene	3.1E-01	mg/kg	3.1E-01	mg/kg	M	3.9E-09	1/mg/kg/day	7.3E+00	1/mg/kg/day	2.9E-08
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	3.6E-09	1/mg/kg/day	7.3E+00	1/mg/kg/day	2.6E-08
	Antimony	1.4E+01	mg/kg	1.4E+01	mg/kg	M	1.3E-08	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Arsenic	2.4E+01	mg/kg	2.4E+01	mg/kg	M	7.0E-08	1/mg/kg/day	1.5E+00	1/mg/kg/day	1.0E-07
	Barium	3.8E+03	mg/kg	3.8E+03	mg/kg	M	3.6E-06	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Chromium	3.5E+01	mg/kg	3.5E+01	mg/kg	M	3.4E-08	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Copper	2.7E+04	mg/kg	2.7E+04	mg/kg	M	2.6E-05	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Iron	2.6E+04	mg/kg	2.6E+04	mg/kg	M	2.5E-05	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Lead	1.4E+03	mg/kg	1.4E+03	mg/kg	M	1.3E-06	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Thallium	1.4E+00	mg/kg	1.4E+00	mg/kg	M	1.4E-09	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Zinc	1.4E+04	mg/kg	1.4E+04	mg/kg	M	1.4E-05	1/mg/kg/day	NA	1/mg/kg/day	N/A
										Total	1.6E-07
										Total Risk Across All Exposure Routes/Pathways	1.0E-06

(1) Medium-Specific (M) EPC selected for hazard calculation.

Table 8.3
Calculation of Cancer Risks - RME
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from Surface Soil at Site 5
Receptor Population: Trespasser
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value (1)	Route EPC Units	EPC Selected for Hazard Calculation (2)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Benzo(a)pyrene	3.1E-01	mg/kg	2.4E-10	mg/m^3	R	3.3E-13	1/mg/kg/day	3.1E+00	1/mg/kg/day	1.0E-12
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.2E-10	mg/m^3	R	3.1E-13	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Antimony	1.4E+01	mg/kg	1.1E-08	mg/m^3	R	1.5E-11	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Arsenic	2.4E+01	mg/kg	1.8E-08	mg/m^3	R	2.6E-11	1/mg/kg/day	1.5E+01	1/mg/kg/day	3.9E-10
	Barium	3.8E+03	mg/kg	2.8E-06	mg/m^3	R	4.0E-09	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Chromium	3.5E+01	mg/kg	2.7E-08	mg/m^3	R	3.7E-11	1/mg/kg/day	4.1E+01	1/mg/kg/day	1.5E-09
	Copper	2.7E+04	mg/kg	2.0E-05	mg/m^3	R	2.8E-08	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Iron	2.6E+04	mg/kg	1.9E-05	mg/m^3	R	2.7E-08	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Lead	1.4E+03	mg/kg	1.0E-06	mg/m^3	R	1.5E-09	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Thallium	1.4E+00	mg/kg	1.1E-09	mg/m^3	R	1.5E-12	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Zinc	1.4E+04	mg/kg	1.1E-05	mg/m^3	R	1.5E-08	1/mg/kg/day	N/A	1/mg/kg/day	N/A
										Total	1.9E-09
										Total Risk Across All Exposure Routes/Pathways	1.9E-09

(1) Route-specific EPC value is equal to the medium EPC value multilplied by 1/PEF (PEF = 1.32E+09mg3/kg).

(2) Route-Specific (R) EPC selected for hazard calculation.

Table 8.4
Calculation of Cancer Risks - RME
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from Surface Soil at Site 5
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value (1)	Route EPC Units	EPC Selected for Hazard Calculation (2)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Benzo(a)pyrene	3.1E-01	mg/kg	2.4E-10	mg/m^3	R	7.3E-14	1/mg/kg/day	3.1E+00	1/mg/kg/day	2.3E-13
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.2E-10	mg/m^3	R	6.7E-14	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Antimony	1.4E+01	mg/kg	1.1E-08	mg/m^3	R	3.2E-12	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Arsenic	2.4E+01	mg/kg	1.8E-08	mg/m^3	R	5.6E-12	1/mg/kg/day	1.5E+01	1/mg/kg/day	8.5E-11
	Barium	3.8E+03	mg/kg	2.8E-06	mg/m^3	R	8.7E-10	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Chromium	3.5E+01	mg/kg	2.7E-08	mg/m^3	R	8.1E-12	1/mg/kg/day	4.1E+01	1/mg/kg/day	3.3E-10
	Copper	2.7E+04	mg/kg	2.0E-05	mg/m^3	R	6.2E-09	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Iron	2.6E+04	mg/kg	1.9E-05	mg/m^3	R	5.9E-09	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Lead	1.4E+03	mg/kg	1.0E-06	mg/m^3	R	3.2E-10	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Thallium	1.4E+00	mg/kg	1.1E-09	mg/m^3	R	3.3E-13	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Zinc	1.4E+04	mg/kg	1.1E-05	mg/m^3	R	3.3E-09	1/mg/kg/day	N/A	1/mg/kg/day	N/A
										Total	4.2E-10
										Total Risk Across All Exposure Routes/Pathways	4.2E-10

(1) Route-specific EPC value is equal to the medium EPC value multilplied by 1/PEF (PEF = 1.32E+09mg3/kg).
(2) Route-Specific (R) EPC selected for hazard calculation.

Table 8.5
Calculation of Cancer Risks - RME
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: At Site 5
Receptor Population: Other Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)pyrene	3.1E-01	mg/kg	3.1E-01	mg/kg	M	5.5E-08	1/mg/kg/day	7.3E+00	1/mg/kg/day	4.0E-07
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	5.1E-08	1/mg/kg/day	7.3E+00	1/mg/kg/day	3.7E-07
	Antimony	1.4E+01	mg/kg	1.4E+01	mg/kg	M	2.4E-06	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Arsenic	2.4E+01	mg/kg	2.4E+01	mg/kg	M	4.2E-06	1/mg/kg/day	1.5E+00	1/mg/kg/day	6.4E-06
	Barium	3.8E+03	mg/kg	3.8E+03	mg/kg	M	6.6E-04	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Chromium	3.5E+01	mg/kg	3.5E+01	mg/kg	M	6.1E-06	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Copper	2.7E+04	mg/kg	2.7E+04	mg/kg	M	4.7E-03	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Iron	2.6E+04	mg/kg	2.6E+04	mg/kg	M	4.5E-03	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Lead	1.4E+03	mg/kg	1.4E+03	mg/kg	M	2.4E-04	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Thallium	1.4E+00	mg/kg	1.4E+00	mg/kg	M	2.5E-07	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Zinc	1.4E+04	mg/kg	1.4E+04	mg/kg	M	2.5E-03	1/mg/kg/day	N/A	1/mg/kg/day	N/A
										Total	7.1E-06
Dermal	Benzo(a)pyrene	3.1E-01	mg/kg	3.1E-01	mg/kg	M	5.1E-08	1/mg/kg/day	7.3E+00	1/mg/kg/day	3.7E-07
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	4.7E-08	1/mg/kg/day	7.3E+00	1/mg/kg/day	3.4E-07
	Antimony	1.4E+01	mg/kg	1.4E+01	mg/kg	M	1.7E-07	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Arsenic	2.4E+01	mg/kg	2.4E+01	mg/kg	M	9.0E-07	1/mg/kg/day	1.5E+00	1/mg/kg/day	1.4E-06
	Barium	3.8E+03	mg/kg	3.8E+03	mg/kg	M	4.7E-05	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Chromium	3.5E+01	mg/kg	3.5E+01	mg/kg	M	4.4E-07	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Copper	2.7E+04	mg/kg	2.7E+04	mg/kg	M	3.3E-04	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Iron	2.6E+04	mg/kg	2.6E+04	mg/kg	M	3.2E-04	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Lead	1.4E+03	mg/kg	1.4E+03	mg/kg	M	1.7E-05	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Thallium	1.4E+00	mg/kg	1.4E+00	mg/kg	M	1.8E-08	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Zinc	1.4E+04	mg/kg	1.4E+04	mg/kg	M	1.8E-04	1/mg/kg/day	NA	1/mg/kg/day	N/A
										Total	2.1E-06
										Total Risk Across All Exposure Routes/Pathways	9.2E-06

(1) Medium-Specific (M) EPC selected for hazard calculation.

Table 8.7
Calculation of Cancer Risks - RME
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: At Site 5
Receptor Population: Resident
Receptor Age: Adult/Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)anthracene	3.4E-01	mg/kg	3.4E-01	mg/kg	M	5.3E-07	1/mg/kg/day	7.3E-01	1/mg/kg/day	3.9E-07
	Benzo(a)pyrene	3.1E-01	mg/kg	3.1E-01	mg/kg	M	4.9E-07	1/mg/kg/day	7.3E+00	1/mg/kg/day	3.6E-06
	Benzo(b)fluoranthene	9.4E-01	mg/kg	9.4E-01	mg/kg	M	1.5E-06	1/mg/kg/day	7.3E-01	1/mg/kg/day	1.1E-06
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	4.5E-07	1/mg/kg/day	7.3E+00	1/mg/kg/day	3.3E-06
	Indeno(1,2,3-cd)pyrene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	4.6E-07	1/mg/kg/day	7.3E-01	1/mg/kg/day	3.4E-07
	4,4'-DDE	1.1E+00	mg/kg	1.1E+00	mg/kg	M	1.6E-06	1/mg/kg/day	3.4E-01	1/mg/kg/day	5.6E-07
	4,4'-DDT	3.8E-01	mg/kg	3.8E-01	mg/kg	M	5.9E-07	1/mg/kg/day	3.4E-01	1/mg/kg/day	2.0E-07
	2,3,7,8-TCDD (dioxin equivalent)	2.1E-05	mg/kg	2.1E-05	mg/kg	M	3.3E-11	1/mg/kg/day	1.5E+05	1/mg/kg/day	4.9E-06
	Aluminum	1.2E+04	mg/kg	1.2E+04	mg/kg	M	1.8E-02	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Antimony	1.4E+01	mg/kg	1.4E+01	mg/kg	M	2.2E-05	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Arsenic	2.4E+01	mg/kg	2.4E+01	mg/kg	M	3.8E-05	1/mg/kg/day	1.5E+00	1/mg/kg/day	5.7E-05
	Barium	3.8E+03	mg/kg	3.8E+03	mg/kg	M	5.9E-03	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Cadmium	4.2E+00	mg/kg	4.2E+00	mg/kg	M	6.6E-06	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Chromium	3.5E+01	mg/kg	3.5E+01	mg/kg	M	5.5E-05	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Copper	2.7E+04	mg/kg	2.7E+04	mg/kg	M	4.2E-02	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Iron	2.6E+04	mg/kg	2.6E+04	mg/kg	M	4.0E-02	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Lead	1.4E+03	mg/kg	1.4E+03	mg/kg	M	2.2E-03	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Manganese	2.6E+02	mg/kg	2.6E+02	mg/kg	M	4.1E-04	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Nickel	3.1E+01	mg/kg	3.1E+01	mg/kg	M	4.8E-05	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Thallium	1.4E+00	mg/kg	1.4E+00	mg/kg	M	2.2E-06	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Vanadium	3.3E+01	mg/kg	3.3E+01	mg/kg	M	5.1E-05	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Zinc	1.4E+04	mg/kg	1.4E+04	mg/kg	M	2.2E-02	1/mg/kg/day	N/A	1/mg/kg/day	N/A
										Total	7.1E-05

Table 8.7
Calculation of Cancer Risks - RME
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: At Site 5
Receptor Population: Resident
Receptor Age: Adult/Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	Benzo(a)anthracene	3.4E-01	mg/kg	3.4E-01	mg/kg	M	2.9E-07	1/mg/kg/day	7.3E-01	1/mg/kg/day	2.1E-07
	Benzo(a)pyrene	3.1E-01	mg/kg	3.1E-01	mg/kg	M	2.7E-07	1/mg/kg/day	7.3E+00	1/mg/kg/day	2.0E-06
	Benzo(b)fluoranthene	9.4E-01	mg/kg	9.4E-01	mg/kg	M	8.1E-07	1/mg/kg/day	7.3E-01	1/mg/kg/day	5.9E-07
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	2.5E-07	1/mg/kg/day	7.3E+00	1/mg/kg/day	1.8E-06
	Indeno(1,2,3-cd)pyrene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	2.5E-07	1/mg/kg/day	7.3E-01	1/mg/kg/day	1.9E-07
	4,4'-DDE	1.1E+00	mg/kg	1.1E+00	mg/kg	M	7.0E-07	1/mg/kg/day	3.4E-01	1/mg/kg/day	2.4E-07
	4,4'-DDT	3.8E-01	mg/kg	3.8E-01	mg/kg	M	7.5E-08	1/mg/kg/day	3.4E-01	1/mg/kg/day	2.6E-08
	2,3,7,8-TCDD (dioxin equivalent)	2.1E-05	mg/kg	2.1E-05	mg/kg	M	4.2E-12	1/mg/kg/day	1.5E+05	1/mg/kg/day	6.3E-07
	Aluminum	1.2E+04	mg/kg	1.2E+04	mg/kg	M	7.7E-04	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Antimony	1.4E+01	mg/kg	1.4E+01	mg/kg	M	9.2E-07	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Arsenic	2.4E+01	mg/kg	2.4E+01	mg/kg	M	4.8E-06	1/mg/kg/day	1.5E+00	1/mg/kg/day	7.2E-06
	Barium	3.8E+03	mg/kg	3.8E+03	mg/kg	M	2.5E-04	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Cadmium	4.2E+00	mg/kg	4.2E+00	mg/kg	M	2.8E-08	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Chromium	3.5E+01	mg/kg	3.5E+01	mg/kg	M	2.3E-06	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Copper	2.7E+04	mg/kg	2.7E+04	mg/kg	M	1.8E-03	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Iron	2.6E+04	mg/kg	2.6E+04	mg/kg	M	1.7E-03	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Lead	1.4E+03	mg/kg	1.4E+03	mg/kg	M	9.2E-05	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Manganese	2.6E+02	mg/kg	2.6E+02	mg/kg	M	1.7E-05	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Nickel	3.1E+01	mg/kg	3.1E+01	mg/kg	M	2.0E-06	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Thallium	1.4E+00	mg/kg	1.4E+00	mg/kg	M	9.5E-08	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Vanadium	3.3E+01	mg/kg	3.3E+01	mg/kg	M	2.2E-06	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Zinc	1.4E+04	mg/kg	1.4E+04	mg/kg	M	9.5E-04	1/mg/kg/day	NA	1/mg/kg/day	N/A
										Total	1.3E-05
										Total Risk Across All Exposure Routes/Pathways	8.4E-05

(1) Medium-Specific (M) EPC selected for hazard calculation.

Table 8.8
Calculation of Cancer Risks - CT
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: At Site 5
Receptor Population: Resident
Receptor Age: Adult/Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)anthracene	3.4E-01	mg/kg	3.4E-01	mg/kg	M	1.4E-07	1/mg/kg/day	7.3E-01	1/mg/kg/day	1.0E-07
	Benzo(a)pyrene	3.1E-01	mg/kg	3.1E-01	mg/kg	M	1.3E-07	1/mg/kg/day	7.3E+00	1/mg/kg/day	9.8E-07
	Benzo(b)fluoranthene	9.4E-01	mg/kg	9.4E-01	mg/kg	M	4.0E-07	1/mg/kg/day	7.3E-01	1/mg/kg/day	2.9E-07
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	1.2E-07	1/mg/kg/day	7.3E+00	1/mg/kg/day	9.0E-07
	Indeno(1,2,3-cd)pyrene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	1.3E-07	1/mg/kg/day	7.3E-01	1/mg/kg/day	9.1E-08
	4,4'-DDE	1.1E+00	mg/kg	1.1E+00	mg/kg	M	4.5E-07	1/mg/kg/day	3.4E-01	1/mg/kg/day	1.5E-07
	4,4'-DDT	3.8E-01	mg/kg	3.8E-01	mg/kg	M	1.6E-07	1/mg/kg/day	3.4E-01	1/mg/kg/day	5.5E-08
	2,3,7,8-TCDD (dioxin equivale	2.1E-05	mg/kg	2.1E-05	mg/kg	M	8.9E-12	1/mg/kg/day	1.5E+05	1/mg/kg/day	1.3E-06
	Aluminum	1.2E+04	mg/kg	1.2E+04	mg/kg	M	5.0E-03	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Antimony	1.4E+01	mg/kg	1.4E+01	mg/kg	M	5.9E-06	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Arsenic	2.4E+01	mg/kg	2.4E+01	mg/kg	M	1.0E-05	1/mg/kg/day	1.5E+00	1/mg/kg/day	1.5E-05
	Barium	3.8E+03	mg/kg	3.8E+03	mg/kg	M	1.6E-03	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Cadmium	4.2E+00	mg/kg	4.2E+00	mg/kg	M	1.8E-06	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Chromium	3.5E+01	mg/kg	3.5E+01	mg/kg	M	1.5E-05	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Copper	2.7E+04	mg/kg	2.7E+04	mg/kg	M	1.1E-02	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Iron	2.6E+04	mg/kg	2.6E+04	mg/kg	M	1.1E-02	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Lead	1.4E+03	mg/kg	1.4E+03	mg/kg	M	5.9E-04	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Manganese	2.6E+02	mg/kg	2.6E+02	mg/kg	M	1.1E-04	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Nickel	3.1E+01	mg/kg	3.1E+01	mg/kg	M	1.3E-05	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Thallium	1.4E+00	mg/kg	1.4E+00	mg/kg	M	6.1E-07	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Vanadium	3.3E+01	mg/kg	3.3E+01	mg/kg	M	1.4E-05	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Zinc	1.4E+04	mg/kg	1.4E+04	mg/kg	M	6.1E-03	1/mg/kg/day	N/A	1/mg/kg/day	N/A
										Total	1.9E-05

Table 8.8
Calculation of Cancer Risks - CT
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: At Site 5
Receptor Population: Resident
Receptor Age: Adult/Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	Benzo(a)anthracene	3.4E-01	mg/kg	3.4E-01	mg/kg	M	2.5E-08	1/mg/kg/day	7.3E-01	1/mg/kg/day	1.8E-08
	Benzo(a)pyrene	3.1E-01	mg/kg	3.1E-01	mg/kg	M	2.3E-08	1/mg/kg/day	7.3E+00	1/mg/kg/day	1.7E-07
	Benzo(b)fluoranthene	9.4E-01	mg/kg	9.4E-01	mg/kg	M	7.0E-08	1/mg/kg/day	7.3E-01	1/mg/kg/day	5.1E-08
	Dibenz(a,h)anthracene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	2.2E-08	1/mg/kg/day	7.3E+00	1/mg/kg/day	1.6E-07
	Indeno(1,2,3-cd)pyrene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	2.2E-08	1/mg/kg/day	7.3E-01	1/mg/kg/day	1.6E-08
	4,4'-DDE	1.1E+00	mg/kg	1.1E+00	mg/kg	M	6.0E-08	1/mg/kg/day	3.4E-01	1/mg/kg/day	2.0E-08
	4,4'-DDT	3.8E-01	mg/kg	3.8E-01	mg/kg	M	6.5E-09	1/mg/kg/day	3.4E-01	1/mg/kg/day	2.2E-09
	2,3,7,8-TCDD (dioxin equivale	2.1E-05	mg/kg	2.1E-05	mg/kg	M	3.6E-13	1/mg/kg/day	1.5E+05	1/mg/kg/day	5.4E-08
	Aluminum	1.2E+04	mg/kg	1.2E+04	mg/kg	M	6.7E-05	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Antimony	1.4E+01	mg/kg	1.4E+01	mg/kg	M	8.0E-08	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Arsenic	2.4E+01	mg/kg	2.4E+01	mg/kg	M	4.2E-07	1/mg/kg/day	1.5E+00	1/mg/kg/day	6.2E-07
	Barium	3.8E+03	mg/kg	3.8E+03	mg/kg	M	2.1E-05	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Cadmium	4.2E+00	mg/kg	4.2E+00	mg/kg	M	2.4E-09	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Chromium	3.5E+01	mg/kg	3.5E+01	mg/kg	M	2.0E-07	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Copper	2.7E+04	mg/kg	2.7E+04	mg/kg	M	1.5E-04	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Iron	2.6E+04	mg/kg	2.6E+04	mg/kg	M	1.5E-04	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Lead	1.4E+03	mg/kg	1.4E+03	mg/kg	M	7.9E-06	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Manganese	2.6E+02	mg/kg	2.6E+02	mg/kg	M	1.5E-06	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Nickel	3.1E+01	mg/kg	3.1E+01	mg/kg	M	1.8E-07	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Thallium	1.4E+00	mg/kg	1.4E+00	mg/kg	M	8.2E-09	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Vanadium	3.3E+01	mg/kg	3.3E+01	mg/kg	M	1.9E-07	1/mg/kg/day	N/A	1/mg/kg/day	N/A
	Zinc	1.4E+04	mg/kg	1.4E+04	mg/kg	M	8.2E-05	1/mg/kg/day	NA	1/mg/kg/day	N/A
										Total	1.1E-06
										Total Risk Across All Exposure Routes/Pathways	2.1E-05

(1) Medium-Specific (M) EPC selected for hazard calculation.

Table 9.1
Summary of Receptor Risks and Hazards for COPCs - RME
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Current/Future
Receptor Population: Trespasser
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	At Site 5	Benzo(a)pyrene	2.0E-07	NA	2.5E-07	4.5E-07	Benzo(a)pyrene	N/A	N/A	NA	N/A	0.0E+00
			Dibenz(a,h)anthracene	1.8E-07	NA	2.3E-07	4.1E-07	Dibenz(a,h)anthracene	N/A	N/A	NA	N/A	0.0E+00
			Antimony	N/A	NA	N/A	0.0E+00	Antimony	Blood	7.1E-03	NA	4.5E-03	1.2E-02
			Arsenic	3.2E-06	NA	9.0E-07	4.1E-06	Arsenic	Skin/Vascular	1.6E-02	NA	4.7E-03	2.1E-02
			Barium	N/A	NA	N/A	0.0E+00	Barium	Kidney, Cardiovascular Gastrointestinal,	1.1E-02	NA	1.5E-02	2.6E-02
			Chromium	N/A	NA	N/A	0.0E+00	Chromium	NOAEL	2.4E-03	NA	9.1E-03	1.1E-02
			Copper	N/A	NA	N/A	0.0E+00	Copper	Gastrointestinal	1.4E-01	NA	1.3E-02	1.5E-01
			Iron	N/A	NA	N/A	0.0E+00	Iron	Gastrointestinal	1.7E-02	NA	1.7E-03	1.9E-02
			Lead	N/A	NA	N/A	0.0E+00	Lead	N/A	N/A	NA	N/A	0.0E+00
			Thallium	N/A	NA	N/A	0.0E+00	Thallium	Skin, Vascular, Liver, Blood, Hair, Skin	4.2E-03	NA	4.0E-04	4.6E-03
			Zinc	N/A	NA	N/A	0.0E+00	Zinc	Blood	9.7E-03	NA	9.2E-04	1.1E-02
			(Total)	3.6E-06	NA	1.4E-06	4.9E-06	(Total)		2.0E-01	NA	4.9E-02	2.5E-01
			Total Risk Across Surface Soil at Site 5				4.9E-06	Total Hazard Index Across Surface Soil at Site 5					2.5E-01
	Air	Emissions from Surface Soil at Site 5	Benzo(a)pyrene	NA	1.0E-12	NA	1.0E-12	Benzo(a)pyrene	N/A	NA	N/A	NA	0.0E+00
			Dibenz(a,h)anthracene	NA	N/A	NA	0.0E+00	Dibenz(a,h)anthracene	N/A	NA	N/A	NA	0.0E+00
			Antimony	NA	N/A	NA	0.0E+00	Antimony	N/A	NA	N/A	NA	0.0E+00
			Arsenic	NA	3.9E-10	NA	3.9E-10	Arsenic	N/A	NA	N/A	NA	0.0E+00
			Barium	NA	N/A	NA	0.0E+00	Barium	Fetus, Cardiovascular Respiratory	NA	6.6E-05	NA	6.6E-05
			Chromium	NA	1.5E-09	NA	1.5E-09	Chromium	System	NA	2.9E-06	NA	2.9E-06
			Copper	NA	N/A	NA	0.0E+00	Copper	N/A	NA	N/A	NA	0.0E+00
			Iron	NA	N/A	NA	0.0E+00	Iron	N/A	NA	N/A	NA	0.0E+00
			Lead	NA	N/A	NA	0.0E+00	Lead	N/A	NA	N/A	NA	0.0E+00
			Thallium	NA	N/A	NA	0.0E+00	Thallium	N/A	NA	N/A	NA	0.0E+00
			Zinc	NA	N/A	NA	0.0E+00	Zinc	N/A	NA	N/A	NA	0.0E+00
			(Total)	NA	1.9E-09	NA	1.9E-09	(Total)		NA	6.9E-05	NA	6.9E-05
			Total Risk Across Emissions from Surface Soil				1.9E-09	Total Hazard Index Across Emissions from Surface Soil					6.9E-05
			Total Risk Across Surface Soil				4.9E-06	Total Hazard Index Across Surface Soil					2.5E-01
			Total Risk Across All Media and All Exposure Routes				4.9E-06	Total Hazard Index Across All Media and All Exposure Routes					2.5E-01

Total Gastrointestinal HI =	1.8E-01
Total Skin HI =	2.6E-02
Total Blood HI =	2.7E-02
Total Vascular HI =	2.6E-02
Total Kidney HI =	2.1E-02
Total Cardiovascular HI =	2.6E-02
Total NOAEL HI =	1.1E-02
Total Liver HI =	4.6E-03
Total Hair HI =	4.6E-03
Total Fetus HI =	6.6E-05
Total Respiratory System HI =	2.9E-06

Table 9.2
Summary of Receptor Risks and Hazards for COPCs - RME
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Current/Future
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	At Site 5	Benzo(a)pyrene	5.0E-08	NA	2.9E-08	7.9E-08	Benzo(a)pyrene	N/A	N/A	NA	N/A	0.0E+00
			Dibenz(a,h)anthracene	4.6E-08	NA	2.6E-08	7.3E-08	Dibenz(a,h)anthracene	N/A	N/A	NA	N/A	0.0E+00
			Antimony	N/A	NA	N/A	0.0E+00	Antimony	Blood	8.9E-03	NA	2.6E-03	1.1E-02
			Arsenic	7.9E-07	NA	1.0E-07	9.0E-07	Arsenic	Skin/Vascular	2.1E-02	NA	2.7E-03	2.3E-02
			Barium	N/A	NA	N/A	0.0E+00	Barium	Kidney, Cardiovascular	1.4E-02	NA	8.6E-03	2.2E-02
			Chromium	N/A	NA	N/A	0.0E+00	Chromium	Gastrointestinal, NOAEL	3.0E-03	NA	5.2E-03	8.2E-03
			Copper	N/A	NA	N/A	0.0E+00	Copper	Gastrointestinal	1.7E-01	NA	7.5E-03	1.8E-01
			Iron	N/A	NA	N/A	0.0E+00	Iron	Gastrointestinal	2.2E-02	NA	9.6E-04	2.3E-02
			Lead	N/A	NA	N/A	0.0E+00	Lead	N/A	N/A	NA	N/A	0.0E+00
			Thallium	N/A	NA	N/A	0.0E+00	Thallium	Skin, Vascular, Liver, Blood, Hair, Skin	5.2E-03	NA	2.3E-04	5.4E-03
			Zinc	N/A	NA	N/A	0.0E+00	Zinc	Blood	1.2E-02	NA	5.3E-04	1.3E-02
			(Total)	8.9E-07	NA	1.6E-07	1.0E-06	(Total)		2.5E-01	NA	2.8E-02	2.8E-01
			Total Risk Across Surface Soil at Site 5				1.0E-06	Total Hazard Index Across Surface Soil at Site 5					2.8E-01
	Air	Emissions from Surface Soil at Site 5	Benzo(a)pyrene	NA	2.3E-13	NA	2.3E-13	Benzo(a)pyrene	N/A	NA	N/A	NA	0.0E+00
			Dibenz(a,h)anthracene	NA	N/A	NA	0.0E+00	Dibenz(a,h)anthracene	N/A	NA	N/A	NA	0.0E+00
			Antimony	NA	N/A	NA	0.0E+00	Antimony	N/A	NA	N/A	NA	0.0E+00
			Arsenic	NA	8.5E-11	NA	8.5E-11	Arsenic	N/A	NA	N/A	NA	0.0E+00
			Barium	NA	N/A	NA	0.0E+00	Barium	Fetus, Cardiovascular Respiratory	NA	7.2E-05	NA	7.2E-05
			Chromium	NA	3.3E-10	NA	3.3E-10	Chromium	System	NA	3.2E-06	NA	3.2E-06
			Copper	NA	N/A	NA	0.0E+00	Copper	N/A	NA	N/A	NA	0.0E+00
			Iron	NA	N/A	NA	0.0E+00	Iron	N/A	NA	N/A	NA	0.0E+00
			Lead	NA	N/A	NA	0.0E+00	Lead	N/A	NA	N/A	NA	0.0E+00
			Thallium	NA	N/A	NA	0.0E+00	Thallium	N/A	NA	N/A	NA	0.0E+00
			Zinc	NA	N/A	NA	0.0E+00	Zinc	N/A	NA	N/A	NA	0.0E+00
			(Total)	NA	4.2E-10	NA	4.2E-10	(Total)		NA	7.6E-05	NA	7.6E-05
			Total Risk Across Emissions from Surface Soil				4.2E-10	Total Hazard Index Across Emissions from Surface Soil					7.6E-05
			Total Risk Across Surface Soil				1.1E-06	Total Hazard Index Across Surface Soil					2.8E-01
			Total Risk Across All Media and All Exposure Routes				1.1E-06	Total Hazard Index Across All Media and All Exposure Routes					2.8E-01

Total Gastrointestinal HI =	2.1E-01
Total Skin HI =	2.9E-02
Total Blood HI =	3.0E-02
Total Vascular HI =	2.9E-02
Total Kidney HI =	2.3E-02
Total Cardiovascular HI =	2.2E-02
Total NOAEL HI =	8.2E-03
Total Liver HI =	5.4E-03
Total Hair HI =	5.4E-03
Total Fetus HI =	7.2E-05
Total Respiratory System HI =	3.2E-06

Table 9.3
Summary of Receptor Risks and Hazards for COPCs - RME
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Current/Future
Receptor Population: Other Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	At Site 5	Benzo(a)pyrene	4.0E-07	NA	3.7E-07	7.7E-07	Benzo(a)pyrene	N/A	N/A	NA	N/A	0.0E+00
			Dibenz(a,h)anthracene	3.7E-07	NA	3.4E-07	7.1E-07	Dibenz(a,h)anthracene	N/A	N/A	NA	N/A	0.0E+00
			Antimony	N/A	NA	N/A	0.0E+00	Antimony	Blood	1.7E-02	NA	8.1E-03	2.5E-02
			Arsenic	6.4E-06	NA	1.4E-06	7.7E-06	Arsenic	Skin/Vascular	4.0E-02	NA	8.4E-03	4.8E-02
			Barium	N/A	NA	N/A	0.0E+00	Barium	Kidney, Cardiovascular	2.6E-02	NA	2.7E-02	5.3E-02
			Chromium	N/A	NA	N/A	0.0E+00	Chromium	Gastrointestinal, NOAEL	5.7E-03	NA	1.6E-02	2.2E-02
			Copper	N/A	NA	N/A	0.0E+00	Copper	Gastrointestinal	3.3E-01	NA	2.3E-02	3.5E-01
			Iron	N/A	NA	N/A	0.0E+00	Iron	Gastrointestinal	4.2E-02	NA	3.0E-03	4.5E-02
			Lead	N/A	NA	N/A	0.0E+00	Lead	N/A	N/A	NA	N/A	0.0E+00
			Thallium	N/A	NA	N/A	0.0E+00	Thallium	Skin, Vascular, Liver, Blood, Hair, Skin	1.0E-02	NA	7.1E-04	1.1E-02
			Zinc	N/A	NA	N/A	0.0E+00	Zinc	Blood	2.3E-02	NA	1.7E-03	2.5E-02
			(Total)	7.1E-06	NA	2.1E-06	9.2E-06	(Total)		4.9E-01	NA	8.8E-02	5.8E-01
			Total Risk Across Surface Soil at Site 5				9.2E-06	Total Hazard Index Across Surface Soil at Site 5					5.8E-01
			Total Risk Across Surface Soil				9.2E-06	Total Hazard Index Across Surface Soil					5.8E-01
			Total Risk Across All Media and All Exposure Routes				9.2E-06	Total Hazard Index Across All Media and All Exposure Routes					5.8E-01

Total Gastrointestinal HI =	4.2E-01
Total Skin HI =	5.9E-02
Total Blood HI =	6.1E-02
Total Vascular HI =	5.9E-02
Total Kidney HI =	4.8E-02
Total Cardiovascular HI =	5.3E-02
Total NOAEL HI =	2.2E-02
Total Liver HI =	1.1E-02
Total Hair HI =	1.1E-02

Table 9.4
Summary of Receptor Risks and Hazards for COPCs - RME
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	At Site 5	Benzo(a)anthracene	N/A	N/A	N/A	0.0E+00	Benzo(a)anthracene	N/A	N/A	NA	N/A	0.0E+00
			Benzo(a)pyrene	N/A	N/A	N/A	0.0E+00	Benzo(a)pyrene	N/A	N/A	NA	N/A	0.0E+00
			Benzo(b)fluoranthene	N/A	N/A	N/A	0.0E+00	Benzo(b)fluoranthene	N/A	N/A	NA	N/A	0.0E+00
			Dibenz(a,h)anthracene	N/A	N/A	N/A	0.0E+00	Dibenz(a,h)anthracene	N/A	N/A	NA	N/A	0.0E+00
			Indeno(1,2,3-cd)pyrene	N/A	N/A	N/A	0.0E+00	Indeno(1,2,3-cd)pyrene	N/A	N/A	NA	N/A	0.0E+00
			4,4'-DDE	N/A	N/A	N/A	0.0E+00	4,4'-DDE	N/A	N/A	NA	N/A	0.0E+00
			4,4'-DDT	N/A	N/A	N/A	0.0E+00	4,4'-DDT	Liver	1.0E-03	NA	2.9E-04	1.3E-03
			2,3,7,8-TCDD (dioxin equivalent)	N/A	N/A	N/A	0.0E+00	2,3,7,8-TCDD (dioxin equivalent)	N/A	N/A	NA	N/A	0.0E+00
			Aluminum	N/A	N/A	N/A	0.0E+00	Aluminum	Central Nervous System	1.6E-02	NA	1.5E-03	1.8E-02
			Antimony	N/A	N/A	N/A	0.0E+00	Antimony	Blood	4.8E-02	NA	3.0E-02	7.8E-02
			Arsenic	N/A	N/A	N/A	0.0E+00	Arsenic	Skin/Vascular	1.1E-01	NA	3.2E-02	1.4E-01
			Barium	N/A	N/A	N/A	0.0E+00	Barium	Kidney, Cardiovascular	7.3E-02	NA	1.0E-01	1.7E-01
			Cadmium	N/A	N/A	N/A	0.0E+00	Cadmium	Kidney	5.8E-03	NA	2.2E-03	7.9E-03
			Chromium	N/A	N/A	N/A	0.0E+00	Chromium	Gastrointestinal, NOAEL	1.6E-02	NA	6.1E-02	7.7E-02
			Copper	N/A	N/A	N/A	0.0E+00	Copper	Gastrointestinal	9.1E-01	NA	8.7E-02	1.0E+00
			Iron	N/A	N/A	N/A	0.0E+00	Iron	Gastrointestinal	1.2E-01	NA	1.1E-02	1.3E-01
			Lead	N/A	N/A	N/A	0.0E+00	Lead	N/A	N/A	NA	N/A	0.0E+00
			Manganese	N/A	N/A	N/A	0.0E+00	Manganese	Central Nervous System	1.8E-02	NA	4.3E-02	6.1E-02
			Nickel	N/A	N/A	N/A	0.0E+00	Nickel	Decreased Body Weight	2.1E-03	NA	5.0E-03	7.1E-03
			Thallium	N/A	N/A	N/A	0.0E+00	Thallium	Skin, Vascular, Liver, Blood, Hair, Skin	2.8E-02	NA	2.7E-03	3.1E-02
			Vanadium	N/A	N/A	N/A	0.0E+00	Vanadium	Kidney	4.5E-02	NA	1.6E-01	2.1E-01
			Zinc	N/A	N/A	N/A	0.0E+00	Zinc	Blood	6.5E-02	NA	6.2E-03	7.1E-02
			(Total)	0.0E+00	NA	0.0E+00	0.0E+00	(Total)		1.5E+00	NA	5.4E-01	2.0E+00
			Total Risk Across Surface Soil at Site 5				0.0E+00	Total Hazard Index Across Surface Soil at Site 5					2.0E+00
			Total Risk Across Surface Soil				0.0E+00	Total Hazard Index Across Surface Soil					2.0E+00
			Total Risk Across All Media and All Exposure Routes				0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					2.0E+00

Total Gastrointestinal HI =	1.2E+00
Total Skin HI =	1.7E-01
Total Blood HI =	1.8E-01
Total Vascular HI =	1.7E-01
Total Kidney HI =	3.6E-01
Total Cardiovascular HI =	1.7E-01
Total NOAEL HI =	7.7E-02
Total Liver HI =	3.2E-02
Total Hair HI =	3.1E-02
Total Decreased Body Weight HI =	7.1E-03
Total Central Nervous System HI =	7.8E-02

Table 9.5
Summary of Receptor Risks and Hazards for COPCs - RME
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	At Site 5	Benzo(a)anthracene	N/A	N/A	N/A	0.0E+00	Benzo(a)anthracene	N/A	N/A	NA	N/A	0.0E+00
			Benzo(a)pyrene	N/A	N/A	N/A	0.0E+00	Benzo(a)pyrene	N/A	N/A	NA	N/A	0.0E+00
			Benzo(b)fluoranthene	N/A	N/A	N/A	0.0E+00	Benzo(b)fluoranthene	N/A	N/A	NA	N/A	0.0E+00
			Dibenz(a,h)anthracene	N/A	N/A	N/A	0.0E+00	Dibenz(a,h)anthracene	N/A	N/A	NA	N/A	0.0E+00
			Indeno(1,2,3-cd)pyrene	N/A	N/A	N/A	0.0E+00	Indeno(1,2,3-cd)pyrene	N/A	N/A	NA	N/A	0.0E+00
			4,4'-DDE	N/A	N/A	N/A	0.0E+00	4,4'-DDE	N/A	N/A	NA	N/A	0.0E+00
			4,4'-DDT	N/A	N/A	N/A	0.0E+00	4,4'-DDT	Liver	9.7E-03	NA	5.7E-04	1.0E-02
			2,3,7,8-TCDD (dioxin equivalent)	N/A	N/A	N/A	0.0E+00	2,3,7,8-TCDD (dioxin equivalent)	N/A	N/A	NA	N/A	0.0E+00
			Aluminum	N/A	N/A	N/A	0.0E+00	Aluminum	Central Nervous System	1.5E-01	NA	3.0E-03	1.5E-01
			Antimony	N/A	N/A	N/A	0.0E+00	Antimony	Blood	4.5E-01	NA	5.9E-02	5.0E-01
			Arsenic	N/A	N/A	N/A	0.0E+00	Arsenic	Skin/Vascular	1.0E+00	NA	6.1E-02	1.1E+00
			Barium	N/A	N/A	N/A	0.0E+00	Barium	Kidney, Cardiovascular	6.9E-01	NA	1.9E-01	8.8E-01
			Cadmium	N/A	N/A	N/A	0.0E+00	Cadmium	Kidney	5.4E-02	NA	4.3E-03	5.8E-02
			Chromium	N/A	N/A	N/A	0.0E+00	Chromium	Gastrointestinal, NOAEL	1.5E-01	NA	1.2E-01	2.7E-01
			Copper	N/A	N/A	N/A	0.0E+00	Copper	Gastrointestinal	8.5E+00	NA	1.7E-01	8.7E+00
			Iron	N/A	N/A	N/A	0.0E+00	Iron	Gastrointestinal	1.1E+00	NA	2.2E-02	1.1E+00
			Lead	N/A	N/A	N/A	0.0E+00	Lead	N/A	N/A	NA	N/A	0.0E+00
			Manganese	N/A	N/A	N/A	0.0E+00	Manganese	Central Nervous System	1.7E-01	NA	8.3E-02	2.5E-01
			Nickel	N/A	N/A	N/A	0.0E+00	Nickel	Decreased Body Weight	2.0E-02	NA	9.7E-03	2.9E-02
			Thallium	N/A	N/A	N/A	0.0E+00	Thallium	Skin, Vascular, Liver, Blood, Hair, Skin	2.6E-01	NA	5.2E-03	2.7E-01
			Vanadium	N/A	N/A	N/A	0.0E+00	Vanadium	Kidney	4.2E-01	NA	3.2E-01	7.4E-01
			Zinc	N/A	N/A	N/A	0.0E+00	Zinc	Blood	6.1E-01	NA	1.2E-02	6.2E-01
			(Total)	0.0E+00	NA	0.0E+00	0.0E+00	(Total)		1.4E+01	NA	1.1E+00	1.5E+01
			Total Risk Across Surface Soil at Site 5				0.0E+00	Total Hazard Index Across Surface Soil at Site 5					1.5E+01
			Total Risk Across Surface Soil				0.0E+00	Total Hazard Index Across Surface Soil					1.5E+01
			Total Risk Across All Media and All Exposure Routes				0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					1.5E+01

Total Gastrointestinal HI =	1.0E+01
Total Skin HI =	1.4E+00
Total Blood HI =	1.4E+00
Total Vascular HI =	1.4E+00
Total Kidney HI =	1.9E+00
Total Cardiovascular HI =	8.8E-01
Total NOAEL HI =	2.7E-01
Total Liver HI =	2.8E-01
Total Hair HI =	2.7E-01
Total Decreased Body Weight HI =	2.9E-02
Total Central Nervous System HI =	4.0E-01

Table 9.6
Summary of Receptor Risks and Hazards for COPCs - RME
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult/Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	At Site 5	Benzo(a)anthracene	3.9E-07	NA	2.1E-07	6.0E-07	Benzo(a)anthracene	N/A	N/A	N/A	N/A	0.0E+00
			Benzo(a)pyrene	3.6E-06	NA	2.0E-06	5.6E-06	Benzo(a)pyrene	N/A	N/A	N/A	N/A	0.0E+00
			Benzo(b)fluoranthene	1.1E-06		5.9E-07	1.7E-06	Benzo(b)fluoranthene	N/A	N/A	N/A	N/A	0.0E+00
			Dibenz(a,h)anthracene	3.3E-06	NA	1.8E-06	5.1E-06	Dibenz(a,h)anthracene	N/A	N/A	N/A	N/A	0.0E+00
			Indeno(1,2,3-cd)pyrene	3.4E-07		1.9E-07	5.2E-07	Indeno(1,2,3-cd)pyrene	N/A	N/A	N/A	N/A	0.0E+00
			4,4'-DDE	5.6E-07		2.4E-07	8.0E-07	4,4'-DDE	N/A	N/A	N/A	N/A	0.0E+00
			4,4'-DDT	2.0E-07		2.6E-08	2.3E-07	4,4'-DDT	Liver	N/A	N/A	N/A	0.0E+00
			2,3,7,8-TCDD (dioxin equivalent)	4.9E-06	NA	6.3E-07	5.6E-06	2,3,7,8-TCDD (dioxin equivalent)	N/A	N/A	N/A	N/A	0.0E+00
			Aluminum	N/A		N/A	0.0E+00	Aluminum	Central Nervous System	N/A	N/A	N/A	0.0E+00
			Antimony	N/A	NA	N/A	0.0E+00	Antimony	Blood	N/A	N/A	N/A	0.0E+00
			Arsenic	5.7E-05	NA	7.2E-06	6.4E-05	Arsenic	Skin/Vascular	N/A	N/A	N/A	0.0E+00
			Barium	N/A	NA	N/A	0.0E+00	Barium	Kidney, Cardiovascular	N/A	N/A	N/A	0.0E+00
			Cadmium	N/A		N/A	0.0E+00	Cadmium	Kidney	N/A	N/A	N/A	0.0E+00
			Chromium	N/A	NA	N/A	0.0E+00	Chromium	Gastrointestinal, NOAEL	N/A	N/A	N/A	0.0E+00
			Copper	N/A	NA	N/A	0.0E+00	Copper	Gastrointestinal	N/A	N/A	N/A	0.0E+00
			Iron	N/A	NA	N/A	0.0E+00	Iron	Gastrointestinal	N/A	N/A	N/A	0.0E+00
			Lead	N/A	NA	N/A	0.0E+00	Lead	N/A	N/A	N/A	N/A	0.0E+00
			Manganese	N/A		N/A	0.0E+00	Manganese	Central Nervous System	N/A	N/A	N/A	0.0E+00
			Nickel	N/A		N/A	0.0E+00	Nickel	Decreased Body Weight	N/A	N/A	N/A	0.0E+00
			Thallium	N/A	NA	N/A	0.0E+00	Thallium	Skin, Vascular, Liver, Blood, Hair, Skin	N/A	N/A	N/A	0.0E+00
			Vanadium	N/A	NA	N/A	0.0E+00	Vanadium	Kidney	N/A	N/A	N/A	0.0E+00
			Zinc	N/A	NA	N/A	0.0E+00	Zinc	Blood	N/A	N/A	N/A	0.0E+00
			(Total)	7.1E-05	NA	1.3E-05	8.4E-05	(Total)		0.0E+00	NA	0.0E+00	0.0E+00
			Total Risk Across Surface Soil at Site 5				8.4E-05	Total Hazard Index Across Surface Soil at Site 5					0.0E+00
			Total Risk Across Surface Soil				8.4E-05	Total Hazard Index Across Surface Soil					0.0E+00
			Total Risk Across All Media and All Exposure Routes				8.4E-05	Total Hazard Index Across All Media and All Exposure Routes					0.0E+00

Total Gastrointestinal HI =	0.0E+00
Total Skin HI =	0.0E+00
Total Blood HI =	0.0E+00
Total Vascular HI =	0.0E+00
Total Kidney HI =	0.0E+00
Total Cardiovascular HI =	0.0E+00
Total NOAEL HI =	0.0E+00
Total Liver HI =	0.0E+00
Total Hair HI =	0.0E+00
Total Decreased Body Weight HI =	0.0E+00
Total Central Nervous System HI =	0.0E+00

Table 9.7
Summary of Receptor Risks and Hazards for COPCs - CT
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	At Site 5	Benzo(a)anthracene	N/A	N/A	N/A	0.0E+00	Benzo(a)anthracene	N/A	N/A	NA	N/A	0.0E+00
			Benzo(a)pyrene	N/A	N/A	N/A	0.0E+00	Benzo(a)pyrene	N/A	N/A	NA	N/A	0.0E+00
			Benzo(b)fluoranthene	N/A	N/A	N/A	0.0E+00	Benzo(b)fluoranthene	N/A	N/A	NA	N/A	0.0E+00
			Dibenz(a,h)anthracene	N/A	N/A	N/A	0.0E+00	Dibenz(a,h)anthracene	N/A	N/A	NA	N/A	0.0E+00
			Indeno(1,2,3-cd)pyrene	N/A	N/A	N/A	0.0E+00	Indeno(1,2,3-cd)pyrene	N/A	N/A	NA	N/A	0.0E+00
			4,4'-DDE	N/A	N/A	N/A	0.0E+00	4,4'-DDE	N/A	N/A	NA	N/A	0.0E+00
			4,4'-DDT	N/A	N/A	N/A	0.0E+00	4,4'-DDT	Liver	3.5E-04	NA	3.9E-05	3.9E-04
			2,3,7,8-TCDD (dioxin equivalent)	N/A	N/A	N/A	0.0E+00	2,3,7,8-TCDD (dioxin equivalent)	N/A	N/A	NA	N/A	0.0E+00
			Aluminum	N/A	N/A	N/A	0.0E+00	Aluminum	Central Nervous System	5.3E-03	NA	2.0E-04	5.6E-03
			Antimony	N/A	N/A	N/A	0.0E+00	Antimony	Blood	1.6E-02	NA	4.0E-03	2.0E-02
			Arsenic	N/A	N/A	N/A	0.0E+00	Arsenic	Skin/Vascular	3.7E-02	NA	4.2E-03	4.1E-02
			Barium	N/A	N/A	N/A	0.0E+00	Barium	Kidney, Cardiovascular	2.5E-02	NA	1.3E-02	3.8E-02
			Cadmium	N/A	N/A	N/A	0.0E+00	Cadmium	Kidney	1.9E-03	NA	2.9E-04	2.2E-03
			Chromium	N/A	N/A	N/A	0.0E+00	Chromium	Gastrointestinal, NOAEL	5.4E-03	NA	8.1E-03	1.4E-02
			Copper	N/A	N/A	N/A	0.0E+00	Copper	Gastrointestinal	3.0E-01	NA	1.2E-02	3.2E-01
			Iron	N/A	N/A	N/A	0.0E+00	Iron	Gastrointestinal	3.9E-02	NA	1.5E-03	4.1E-02
			Lead	N/A	N/A	N/A	0.0E+00	Lead	N/A	N/A	NA	N/A	0.0E+00
			Manganese	N/A	N/A	N/A	0.0E+00	Manganese	Central Nervous System	6.0E-03	NA	5.7E-03	1.2E-02
			Nickel	N/A	N/A	N/A	0.0E+00	Nickel	Decreased Body Weight	7.0E-04	NA	6.7E-04	1.4E-03
			Thallium	N/A	N/A	N/A	0.0E+00	Thallium	Skin, Vascular, Liver, Blood, Hair, Skin	9.4E-03	NA	3.6E-04	9.8E-03
			Vanadium	N/A	N/A	N/A	0.0E+00	Vanadium	Kidney	1.5E-02	NA	2.2E-02	3.7E-02
			Zinc	N/A	N/A	N/A	0.0E+00	Zinc	Blood	2.2E-02	NA	8.3E-04	2.3E-02
			(Total)	0.0E+00	NA	0.0E+00	0.0E+00	(Total)		4.9E-01	NA	7.3E-02	5.6E-01
			Total Risk Across Surface Soil at Site 5				0.0E+00	Total Hazard Index Across Surface Soil at Site 5					5.6E-01
			Total Risk Across Surface Soil				0.0E+00	Total Hazard Index Across Surface Soil					5.6E-01
			Total Risk Across All Media and All Exposure Routes				0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					5.6E-01

Total Gastrointestinal HI =	3.7E-01
Total Skin HI =	5.1E-02
Total Blood HI =	5.2E-02
Total Vascular HI =	5.1E-02
Total Kidney HI =	8.0E-02
Total Cardiovascular HI =	3.8E-02
Total NOAEL HI =	1.4E-02
Total Liver HI =	1.0E-02
Total Hair HI =	9.8E-03
Total Decreased Body Weight HI =	1.4E-03
Total Central Nervous System HI =	1.7E-02

Table 9.8
Summary of Receptor Risks and Hazards for COPCs - CT
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	At Site 5	Benzo(a)anthracene	N/A	N/A	N/A	0.0E+00	Benzo(a)anthracene	N/A	N/A	NA	N/A	0.0E+00
			Benzo(a)pyrene	N/A	N/A	N/A	0.0E+00	Benzo(a)pyrene	N/A	N/A	NA	N/A	0.0E+00
			Benzo(b)fluoranthene	N/A	N/A	N/A	0.0E+00	Benzo(b)fluoranthene	N/A	N/A	NA	N/A	0.0E+00
			Dibenz(a,h)anthracene	N/A	N/A	N/A	0.0E+00	Dibenz(a,h)anthracene	N/A	N/A	NA	N/A	0.0E+00
			Indeno(1,2,3-cd)pyrene	N/A	N/A	N/A	0.0E+00	Indeno(1,2,3-cd)pyrene	N/A	N/A	NA	N/A	0.0E+00
			4,4'-DDE	N/A	N/A	N/A	0.0E+00	4,4'-DDE	N/A	N/A	NA	N/A	0.0E+00
			4,4'-DDT	N/A	N/A	N/A	0.0E+00	4,4'-DDT	Liver	3.2E-03	NA	9.2E-05	3.3E-03
			2,3,7,8-TCDD (dioxin equivalent)	N/A	N/A	N/A	0.0E+00	2,3,7,8-TCDD (dioxin equivalent)	N/A	N/A	NA	N/A	0.0E+00
			Aluminum	N/A	N/A	N/A	0.0E+00	Aluminum	Central Nervous System	5.0E-02	NA	4.7E-04	5.0E-02
			Antimony	N/A	N/A	N/A	0.0E+00	Antimony	Blood	1.5E-01	NA	9.4E-03	1.6E-01
			Arsenic	N/A	N/A	N/A	0.0E+00	Arsenic	Skin/Vascular	3.5E-01	NA	9.9E-03	3.6E-01
			Barium	N/A	N/A	N/A	0.0E+00	Barium	Kidney, Cardiovascular	2.3E-01	NA	3.1E-02	2.6E-01
			Cadmium	N/A	N/A	N/A	0.0E+00	Cadmium	Kidney	1.8E-02	NA	6.8E-04	1.9E-02
			Chromium	N/A	N/A	N/A	0.0E+00	Chromium	Gastrointestinal, NOAEL	5.0E-02	NA	1.9E-02	6.9E-02
			Copper	N/A	N/A	N/A	0.0E+00	Copper	Gastrointestinal	2.8E+00	NA	2.7E-02	2.9E+00
			Iron	N/A	N/A	N/A	0.0E+00	Iron	Gastrointestinal	3.7E-01	NA	3.5E-03	3.7E-01
			Lead	N/A	N/A	N/A	0.0E+00	Lead	N/A	N/A	NA	N/A	0.0E+00
			Manganese	N/A	N/A	N/A	0.0E+00	Manganese	Central Nervous System	5.6E-02	NA	1.3E-02	6.9E-02
			Nickel	N/A	N/A	N/A	0.0E+00	Nickel	Decreased Body Weight	6.6E-03	NA	1.6E-03	8.1E-03
			Thallium	N/A	N/A	N/A	0.0E+00	Thallium	Skin, Vascular, Liver, Blood, Hair, Skin	8.8E-02	NA	8.3E-04	8.9E-02
			Vanadium	N/A	N/A	N/A	0.0E+00	Vanadium	Kidney	1.4E-01	NA	5.1E-02	1.9E-01
			Zinc	N/A	N/A	N/A	0.0E+00	Zinc	Blood	2.0E-01	NA	1.9E-03	2.1E-01
			(Total)	0.0E+00	NA	0.0E+00	0.0E+00	(Total)		4.5E+00	NA	1.7E-01	4.7E+00
							Total Risk Across Surface Soil at Site 5	0.0E+00					Total Hazard Index Across Surface Soil at Site 5	4.7E+00
							Total Risk Across Surface Soil	0.0E+00					Total Hazard Index Across Surface Soil	4.7E+00
							Total Risk Across All Media and All Exposure Routes	0.0E+00					Total Hazard Index Across All Media and All Exposure Routes	4.7E+00

Total Gastrointestinal HI =	3.3E+00
Total Skin HI =	4.4E-01
Total Blood HI =	4.5E-01
Total Vascular HI =	4.4E-01
Total Kidney HI =	5.7E-01
Total Cardiovascular HI =	2.6E-01
Total NOAEL HI =	6.9E-02
Total Liver HI =	9.2E-02
Total Hair HI =	8.9E-02
Total Decreased Body Weight HI =	8.1E-03
Total Central Nervous System HI =	1.2E-01

Table 9.9
Summary of Receptor Risks and Hazards for COPCs - CT
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult/Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	At Site 5	Benzo(a)anthracene	1.0E-07	NA	1.8E-08	1.2E-07	Benzo(a)anthracene	N/A	N/A	N/A	N/A	0.0E+00
			Benzo(a)pyrene	9.8E-07	NA	1.7E-07	1.1E-06	Benzo(a)pyrene	N/A	N/A	N/A	N/A	0.0E+00
			Benzo(b)fluoranthene	2.9E-07	NA	5.1E-08	3.4E-07	Benzo(b)fluoranthene	N/A	N/A	N/A	N/A	0.0E+00
			Dibenz(a,h)anthracene	9.0E-07	NA	1.6E-07	1.1E-06	Dibenz(a,h)anthracene	N/A	N/A	N/A	N/A	0.0E+00
			Indeno(1,2,3-cd)pyrene	9.1E-08	NA	1.6E-08	1.1E-07	Indeno(1,2,3-cd)pyrene	N/A	N/A	N/A	N/A	0.0E+00
			4,4'-DDE	1.5E-07	NA	2.0E-08	1.7E-07	4,4'-DDE	N/A	N/A	N/A	N/A	0.0E+00
			4,4'-DDT	5.5E-08	NA	2.2E-09	5.7E-08	4,4'-DDT	Liver	N/A	N/A	N/A	0.0E+00
			2,3,7,8-TCDD (dioxin equivalent)	1.3E-06	NA	5.4E-08	1.4E-06	2,3,7,8-TCDD (dioxin equivalent)	N/A	N/A	N/A	N/A	0.0E+00
			Aluminum	N/A	NA	N/A	0.0E+00	Aluminum	Central Nervous System	N/A	N/A	N/A	0.0E+00
			Antimony	N/A	NA	N/A	0.0E+00	Antimony	Blood	N/A	N/A	N/A	0.0E+00
			Arsenic	1.5E-05	NA	6.2E-07	1.6E-05	Arsenic	Skin/Vascular	N/A	N/A	N/A	0.0E+00
			Barium	N/A	NA	N/A	0.0E+00	Barium	Kidney, Cardiovascular	N/A	N/A	N/A	0.0E+00
			Cadmium	N/A	NA	N/A	0.0E+00	Cadmium	Kidney	N/A	N/A	N/A	0.0E+00
			Chromium	N/A	NA	N/A	0.0E+00	Chromium	Gastrointestinal, NOAEL	N/A	N/A	N/A	0.0E+00
			Copper	N/A	NA	N/A	0.0E+00	Copper	Gastrointestinal	N/A	N/A	N/A	0.0E+00
			Iron	N/A	NA	N/A	0.0E+00	Iron	Gastrointestinal	N/A	N/A	N/A	0.0E+00
			Lead	N/A	NA	N/A	0.0E+00	Lead	N/A	N/A	N/A	N/A	0.0E+00
			Manganese	N/A	NA	N/A	0.0E+00	Manganese	Central Nervous System	N/A	N/A	N/A	0.0E+00
			Nickel	N/A	NA	N/A	0.0E+00	Nickel	Decreased Body Weight	N/A	N/A	N/A	0.0E+00
			Thallium	N/A	NA	N/A	0.0E+00	Thallium	Skin, Vascular, Liver, Blood, Hair, Skin	N/A	N/A	N/A	0.0E+00
			Vanadium	N/A	NA	N/A	0.0E+00	Vanadium	Kidney	N/A	N/A	N/A	0.0E+00
			Zinc	N/A	NA	N/A	0.0E+00	Zinc	Blood	N/A	N/A	N/A	0.0E+00
			(Total)	1.9E-05	NA	1.1E-06	2.0E-05	(Total)		0.0E+00	NA	0.0E+00	0.0E+00
			Total Risk Across Surface Soil at Site 5				2.0E-05	Total Hazard Index Across Surface Soil at Site 5					0.0E+00
			Total Risk Across Surface Soil				2.0E-05	Total Hazard Index Across Surface Soil					0.0E+00
			Total Risk Across All Media and All Exposure Routes				2.0E-05	Total Hazard Index Across All Media and All Exposure Routes					0.0E+00

Total Gastrointestinal HI =	0.0E+00
Total Skin HI =	0.0E+00
Total Blood HI =	0.0E+00
Total Vascular HI =	0.0E+00
Total Kidney HI =	0.0E+00
Total Cardiovascular HI =	0.0E+00
Total NOAEL HI =	0.0E+00
Total Liver HI =	0.0E+00
Total Hair HI =	0.0E+00
Total Decreased Body Weight HI =	0.0E+00
Total Central Nervous System HI =	0.0E+00

Table 10.1
Summary of Receptor Risks and Hazards for COPCs - RME
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	At Site 5					0.0E+00	Arsenic	Skin/Vascular	1.1E-01	NA	3.2E-02	1.4E-01
							0.0E+00	Barium	Kidney, Cardiovascular	7.3E-02	NA	1.0E-01	1.7E-01
							0.0E+00	Copper	Gastrointestinal	9.1E-01	NA	8.7E-02	1.0E+00
							0.0E+00	Iron	Gastrointestinal	1.2E-01	NA	1.1E-02	1.3E-01
							0.0E+00	Vanadium	Kidney	4.5E-02	NA	1.6E-01	2.1E-01
			(Total)	0.0E+00	NA	0.0E+00	0.0E+00	(Total)		1.3E+00	NA	3.9E-01	1.7E+00
			Total Risk Across Surface Soil at Site 5				0.0E+00	Total Hazard Index Across Surface Soil at Site 5					1.7E+00
			Total Risk Across Surface Soil				0.0E+00	Total Hazard Index Across Surface Soil					1.7E+00
			Total Risk Across All Media and All Exposure Routes				0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					1.7E+00

Total Gastrointestinal HI =	1.1E+00
Total Skin HI =	1.4E-01
Total Vascular HI =	1.4E-01
Total Kidney HI =	3.5E-01
Total Cardiovascular HI =	1.7E-01

Table 10.2
Summary of Receptor Risks and Hazards for COPCs - RME
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	At Site 5						Aluminum	Central Nervous System	1.5E-01	NA	3.0E-03	1.5E-01
								Antimony	Blood	4.5E-01	NA	5.9E-02	5.0E-01
								Arsenic	Skin/Vascular	1.0E+00	NA	6.1E-02	1.1E+00
								Barium	Kidney, Cardiovascular	6.9E-01	NA	1.9E-01	8.8E-01
								Chromium	Gastrointestinal, NOAEL	1.5E-01	NA	1.2E-01	2.7E-01
								Copper	Gastrointestinal	8.5E+00	NA	1.7E-01	8.7E+00
								Iron	Gastrointestinal	1.1E+00	NA	2.2E-02	1.1E+00
								Manganese	Central Nervous System	1.7E-01	NA	8.3E-02	2.5E-01
								Thallium	Skin, Vascular, Liver, Blood, Hair, Skin	2.6E-01	NA	5.2E-03	2.7E-01
								Vanadium	Kidney	4.2E-01	NA	3.2E-01	7.4E-01
								Zinc	Blood	6.1E-01	NA	1.2E-02	6.2E-01
			(Total)	0.0E+00	NA	0.0E+00	0.0E+00	(Total)		1.4E+01	NA	1.0E+00	1.5E+01
			Total Risk Across Surface Soil at Site 5				0.0E+00	Total Hazard Index Across Surface Soil at Site 5					1.5E+01
			Total Risk Across Surface Soil				0.0E+00	Total Hazard Index Across Surface Soil					1.5E+01
			Total Risk Across All Media and All Exposure Routes				0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					1.5E+01

Total Gastrointestinal HI =	1.0E+01
Total Skin HI =	1.4E+00
Total Blood HI =	1.4E+00
Total Vascular HI =	1.4E+00
Total Kidney HI =	1.8E+00
Total Cardiovascular HI =	8.8E-01
Total NOAEL HI =	2.7E-01
Total Liver HI =	2.7E-01
Total Hair HI =	2.7E-01
Total Central Nervous System HI =	4.0E-01

Table 10.3
Summary of Receptor Risks and Hazards for COPCs - CT
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	At Site 5						Antimony	Blood	1.5E-01	NA	9.4E-03	1.6E-01
								Arsenic	Skin/Vascular	3.5E-01	NA	9.9E-03	3.6E-01
								Barium	Kidney, Cardiovascular	2.3E-01	NA	3.1E-02	2.6E-01
								Copper	Gastrointestinal	2.8E+00	NA	2.7E-02	2.9E+00
								Iron	Gastrointestinal	3.7E-01	NA	3.5E-03	3.7E-01
								Vanadium	Kidney	1.4E-01	NA	5.1E-02	1.9E-01
								Zinc	Blood	2.0E-01	NA	1.9E-03	2.1E-01
			(Total)	0.0E+00	NA	0.0E+00	0.0E+00	(Total)		4.3E+00	NA	1.3E-01	4.4E+00
			Total Risk Across Surface Soil at Site 5				0.0E+00	Total Hazard Index Across Surface Soil at Site 5					4.4E+00
			Total Risk Across Surface Soil				0.0E+00	Total Hazard Index Across Surface Soil					4.4E+00
			Total Risk Across All Media and All Exposure Routes				0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					4.4E+00

Total Gastrointestinal HI =	3.2E+00
Total Skin HI =	3.6E-01
Total Blood HI =	3.6E-01
Total Vascular HI =	3.6E-01
Total Kidney HI =	5.5E-01
Total Cardiovascular HI =	2.6E-01

Appendix F

Draft Final
Expanded Remedial Investigation/Human Health Risk Assessment/Ecological Risk Assessment for Site 5
St. Juliens Creek Annex
Chesapeake, Virginia

Contents:
Responses to technical comments on the draft report and revised human health risk assessment for shallow groundwater

Prepared for

Department of the Navy
Naval Facilities Engineering Command
Mid-Atlantic

Contract No. N62470-95-D-6007
Navy CLEAN III Program, Contract Task Order 0028

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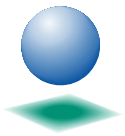
Prepared by



CH2MHILL

Responses to Technical Comments on the *Draft Expanded Remedial Investigation/Human Health Risk Assessment/Ecological Risk Assessment for Site 5, St. Juliens Creek Annex, Chesapeake, Virginia* (CH2M HILL, November 2004)

Human Health Risk Assessment Comments

EPA Comment 1:

Section 2.3.2, Expanded Remedial Investigation - December 2003, Surface Soil Sampling and Section 4.0, Human Health Risk Assessment Addendum. Typically, surface and subsurface soil is evaluated together in the risk assessment to provide an overall soil characterization and to determine the combined risk for both soils, as well as, to determine the total site risk (surface soil + subsurface soil + groundwater + air). Therefore, in order to fully characterize the extent of contamination in soils (surface and subsurface) the report should provide the subsurface soil sampling depths, type of analytical analysis, the receptors that were evaluated for subsurface soil, and the combined surface and subsurface soil risk for each receptor.

Response to EPA Comment 1:

Agree. The *Final Remedial Investigation/Human Health Risk Assessment/Ecological Risk Assessment Report for Sites 3, 4, 5, and 6* (CH2M HILL, March 2003) included an evaluation of risks to receptors associated with exposure to combined surface and subsurface soils and the total site risk. Based on the results of the analysis, the St. Juliens Creek Annex Project Management Team determined the risks/hazards associated with arsenic and iron in subsurface soils to be acceptable and that no additional evaluation of subsurface soil was required.

The primary objective of the 2004 Expanded Remedial Investigation was to further define the nature and extent of surface soil and groundwater contamination to support the evaluation of remedial alternatives for Site 5. Therefore, to meet the objective, only surface soil samples (and groundwater samples) were collected and analyzed as part of this investigation.

EPA Comment 2:

Table 4-7, Calculations of Blood Lead Concentrations (PbBs). Since the standard default GSDi for a homogenous population was not used in the model (standard default of 2.1), please provide the rationale for not applying the standard default value? In addition, please provide the rationale for not using the standard default values for Baseline PbB?

Response to EPA Comment 2:

Agree. The version of the lead model used was an older version with a previous GSDi default value. However, updating the standard default GSDi to the current value of 2.1

(from the 1.9 value used) will not change the result in the risk assessment. Same is true for the Baseline PbB value.

EPA Comment 3:

Section 6.2, Groundwater. The report states, "Shallow groundwater (Columbia Aquifer) is not considered a potable water source at or in the vicinity of Site 5 due to its poor quality and low yield. Therefore, human health risks were based on the construction worker scenario only and no acceptable risks were identified." Please provide the supporting documentation the groundwater quality is poor and of a low yield? Table D-3 provides the metal analytical results for groundwater. When comparing the total metal to the dissolved metal results, there is no notable difference in the results for aluminum, iron, and manganese (per EPA Region 3 guidance, see EPA, *Guidance on Selecting Analytical Metal Results from Monitoring Well Samples for the Quantitative Assessment of Risk*, August 10, 1992). Therefore, the use of total metal results for assessing risk is appropriate. In addition, the report should provide the actual quantitative risk results for the construction worker that is referred in the report. Finally, unless deed restrictions (IC's) are in place or will be acquired for the site, future residential groundwater risk must be evaluated.

Response to EPA Comment 3:

Agree. A revised quantitative HHRA was conducted for the future child and lifetime residential receptor using the most recent shallow groundwater data and is attached for your review. Analytical results for the unfiltered groundwater were used in this evaluation. The revision also summarizes the quantitative HHRA results conducted for the construction worker receptor coming in contact with contaminants in shallow groundwater, as part of the March 2003 RI report. This revision will be incorporated into the Final Expanded Remedial Investigation report.

EPA Comment 4:

Table 2.1. An incorrect industrial screening toxicity value is recorded for trichloroethene (TCE). The most current RBC is 7.2 mg/kg. Although the most current toxicity value for TCE has been withdrawn, use of an outdated and previously withdrawn TCE toxicity value is less appropriate then use of a more current value. (Note: TCE is still not considered a COPC even when the most current value is using for screening).

Response to EPA Comment 4:

Agree. However, at the time of the risk assessment, the most current TCE screening value was used and use of the current screening value will not change the result in the risk assessment.

EPA Comment 5:

Table 2.3. An incorrect residential screening toxicity value is recorded for trichloroethene (TCE). The most current RBC is 1.6 mg/kg. Although the most current toxicity value for TCE has been withdrawn, use of an outdated and previously withdrawn TCE toxicity value is less appropriate then use of a more current value. (Note: TCE is still not considered a COPC even when the most current value is using for screening).

Response to EPA Comment 5:

Agree. However, at the time of the risk assessment, the most current TCE screening value was used and use of the current screening value will not change the result in the risk assessment.

Ecological Risk Assessment Comments

General Comment:

It should be noted that BTAG representatives attended a site visit and remedial scoping meeting for the site on March 15, 2005. The preliminary remedial plan presented at the meeting (i.e., excavation of the source area and adjacent contaminated soil) would satisfactorily address the following technical comments on the risk assessment and would also facilitate wetland mitigation activities.

Response to EPA General Comment:

Although excavation of the source area and adjacent contaminated soil is currently planned at the site, the Port Authority has not requested further discussion on the proposed wetland creation. Therefore, the SJCA Project Management Team plan to move forward with finalizing the Expanded RI report; conducting an EE/CA for waste removal, including consideration for expansion of the existing low-quality wetland, and re-evaluating the remaining potential risks for remediation.

EPA Comment 1:

Section 2 should provide topographic information with the groundwater elevations to support the evaluation of potential remedial alternatives, particularly for excavation and wetland restoration.

Response to EPA Comment 1:

Agree. Topographic information will be incorporated in the Final Expanded Remedial Investigation. The groundwater elevations are provided in Table 2-3 and Figures 2-5 and 2-6.

EPA Comment 2:

Section 5.2.2.1, Medium-Specific Screening Values, on page 5-8 states that BTAG screening values or alternate screening values (developed specific to Naval Amphibious Base - Little Creek) were used to evaluate risk to ecological receptors in soil. BTAG strongly recommends that only BTAG screening values be used in the ERA. If no BTAG value is available, other values can be used. However, appropriate documentation should be provided.

Response to EPA Comment 2:

The screening values used in the Expanded Remedial Investigation were the same as previously accepted for St. Juliens Creek Annex ERAs: *Final Remedial Investigation/Human Health Risk Assessment/Ecological Risk Assessment Report for Sites 3, 4, 5, and 6* (CH2M HILL, March 2003) and *Final Remedial Investigation/Human Health Risk Assessment/Ecological Risk*

Assessment Report for Site 2 (CH2M HILL, February 2004). The source of any alternate screening values will be clearly documented.

EPA Comment 3:

Section 5.2.5.1, Exposure Assumption Refinements, on page 5-13 states that average chemical concentrations were used instead of maximum concentrations in Step 3A to evaluate potential impacts to terrestrial plants and terrestrial and aquatic invertebrates. The section further states that while immobile invertebrates could be impacted by maximum concentrations, the invertebrate population as a whole will be exposed to a range of chemical concentrations, therefore the average concentration is a more realistic indicator of the overall potential for population- or community-level effects. What this does not consider is the spatial extent of the exceedances (hot spots) and the size of the area that would present potential risk to invertebrates. This also needs to be considered when evaluating risk to the populations of invertebrates at the site, particularly when selecting contaminants of potential concern. In addition, an evaluation of an average exposure should include consideration of the standard deviation of the mean. A more appropriate refinement step would be to compare to the 95% upper confidence limit of the mean.

Response to EPA Comment 3:

The spatial trends in the concentration of key chemicals indicating potential risk was presented in Section 5.4.1 text and associated figures. Additional text will be added to further characterize the implications of these trends on risks to terrestrial plants/soil invertebrates.

EPA Comment 4:

Section 8.2.5.1, Exposure Assumption Refinements, on page 5-13 states that average chemical concentrations were used instead of more conservative maximum concentrations to evaluate potential impacts to individual avian and mammal receptors, because average chemical concentrations more accurately estimate exposure to these mobile receptors that are likely to forage over a large area. This approach is appropriate only for those receptors that have home ranges larger than the area of the site. Some receptors may have home ranges smaller than the size of the site (i.e., shrew), and would therefore be more affected by more localized areas of contamination. For Site 5, the site is much larger than the home ranges of some wildlife receptors, and in these cases, the use of average concentrations is not appropriate.

Response to EPA Comment 4:

The spatial trends in the concentration of key chemicals indicating potential risk was presented in Section 5.4.1 text and associated figures. Additional text will be added to characterize the implications of these trends on risks to the wildlife receptors for which risks were indicated and which have smaller home ranges than encompassed by the Site 5 area. A discussion of the uncertainties surrounding the estimation of these risks will be added.

EPA Comment 5:

Section 5.4.1.2, Spatial Trend Evaluation of Select COCs, on page 5-19 discusses the spatial distribution of Total DDT at the site. The section states that the plot of total DDT

concentrations indicates the widespread distribution in soil and does not show localized areas of high concentration. The section concludes that their presence in surface soil likely represents historic application and not site-specific activities. A similar conclusion is made in Section 6. However, this conclusion is not supported by Figure 6-1 which shows several locations (SS09, SS32, SS35, SS56, and SS59) where DDT concentrations are in excess of 1,000 µg/kg and much higher than most samples on the site. BTAG is particularly concerned with the higher concentrations of DDE (4,700 µg/kg) and DDT (3,100 µg/kg) found at SS35. These concentrations are much higher than surrounding areas and could represent site-related sources.

Response to EPA Comment 5:

No source of pesticides has been identified at the site. The surface soil sample locations (SS09, SS32, SS35, SS56, and SS59) where DDT concentrations are in excess of 1,000 µg/kg are located adjacent to or within the wooded areas of the site where little to no disturbance has occurred since the historical applications of pesticides at the facility. The remainder of the site is mowed grass. A discussion of the uncertainties surrounding these higher detected concentrations will be added to the ERA. The area with the higher concentrations of DDE (4,700 µg/kg) and DDT (3,100 µg/kg) found at SS35 and some locations just adjacent to the wooded areas (SS09, SS32, and SS56) will be considered for mitigation during evaluation of remedial alternatives.

Revised Human Health Risk Assessment for Shallow Groundwater and Summary of Deep Groundwater Quality at Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Revised Human Health Risk Assessment for Shallow Groundwater

Shallow groundwater (Columbia Aquifer) is not considered a regional potable water source at or in the vicinity of St. Juliens Creek Annex (SJCA) due to its poor quality and low yield. Therefore, during the Remedial Investigation/Human Health Risk Assessment/Ecological Risk Assessment (RI/HHRA/ERA) for Site 5 (CH2M HILL, March 2003), human health risks were only evaluated for a construction worker scenario based on dermal contact. However, because the site soils and waste are being considered for removal with the intent of achieving unlimited use and unrestricted exposure (UU/UE) for the site, the shallow groundwater data were evaluated for exposure by a future child and lifetime (child/adult) resident. Only metals were evaluated because the concentrations of organics did not exceed human health risk-based concentrations (RBCs).

Figure 1 shows the shallow and deep monitoring well locations and general shallow groundwater flow direction at Site 5. Table 1 provides the shallow groundwater data collected to-date.

Methodology

The baseline HHRA was conducted to evaluate the potential human health risks associated with exposure of a future child and lifetime resident to constituents detected in shallow groundwater. Reasonable maximum exposure (RME) and central tendency exposure (CTE) risk estimates were calculated following EPA guidance. When comparing the concentrations of total (un-filtered) metal to the dissolved (filtered) metal results, there is no notable difference in the concentrations for aluminum, iron, and manganese (EPA, August 1992). Therefore, the total metal concentrations were used for evaluation.

In general, the baseline HHRA methodology described in the RI/HHRA/ERA (CH2MHILL, March 2003) was followed. At the time the HHRA was conducted, the latest EPA Region III RBC table (EPA, October 2004) was used as a source of screening values. Also, exposure point concentrations (EPCs) for detected constituents selected as contaminants of potential concern (COPCs) were calculated using the latest version (v. 3.00.02) of EPA's ProUCL software (EPA, 2004). In addition, EPA's latest guidance (EPA, 2003) for choosing the source(s) of toxicity values (used to calculate cancer and non-cancer risks) was followed. The hierarchy for the source of toxicity values was as follows: (1) Integrated Risk Information System (IRIS), (2) Provisional Peer-Reviewed Toxicity Values (PPRTV), (3) National Center for Environmental Assessment (NCEA), and (4) Health Effects Assessment

Tables (HEAST). This hierarchy is according to EPA's most recent guidance for sources of toxicity values (EPA, 2003).

Summary of Potential Risks

The complete risk assessment tables from the revised HHRA are provided in Attachment A. A summary of the unacceptable human health risks from exposure of a future child and lifetime resident to shallow groundwater at Site 5 is provided on Table 2.

The noncarcinogenic risks to a future child resident who uses the shallow groundwater beneath Site 5 as a potable water supply are above EPA's target non-cancer Hazard Index (HI) of 1.0 when either the RME (HI=43) or CTE (HI=16) assumptions are used. The potential RME hazards are based on ingestion of aluminum (HI = 3.1), arsenic (HI = 2.3), cadmium (HI = 1.4), iron (HI = 11), manganese (HI =14), thallium (HI = 1.9), and vanadium (HI = 1.8) and dermal contact with manganese (HI =2.3). The potential CTE hazards are based on ingestion of iron (HI =5.9) and manganese (HI =5.9) (Table 2).

The target organs that could potentially be affected using the RME estimates, are the central nervous system (CNS) (HI = 19), gastrointestinal system (HI = 12), skin (HI = 4.2), vascular system (HI = 4.2), kidney (HI = 4.0), liver (HI = 1.9), blood (HI = 2.8), and hair (HI = 1.9) (Table 9.1). Similarly, the target organs that might be affected by metals present in the shallow groundwater, calculated using the CTE estimates, are the CNS (HI = 6.9), skin (HI = 1.9), vascular (HI = 1.9), gastrointestinal system (HI = 6.1) and blood (HI =1.1) (Attachment A, Table 9.1 CTE).

The RME cancer risk ($2.4x10^{-4}$) to the future lifetime resident was slightly above EPA's target cancer risk range ($1x10^{-4}$ to $1x10^{-6}$) for ingestion of arsenic. However, the CTE cancer risk ($5.4x10^{-5}$) is within the target cancer risk range (Table 2).

There were no human health risks identified for a construction worker scenario based on dermal contact, the results were below the EPA's acceptable risk ranges ($1x10^{-4}$ to $1x10^{-6}$ for carcinogens and HI of 1.0 for noncarcinogens) (Table 2) (CH2M HILL, March 2003) .

Background Upper Tolerance Limit Comparison

The background data and statistical evaluation included in the *Final Background Investigation Report Addendum for Groundwater* (CH2M HILL, August 2004) was used to determine if the constituents posing potential unacceptable risk identified in site groundwater may be present at concentrations similar to background concentrations at SJCA. The methodology discussed in the background investigation report was followed for this evaluation. The maximum detected site concentrations (unfiltered data) were compared to the 95% upper tolerance limits (UTLs) for dredge fill.

As mentioned above, the constituents that pose potential unacceptable risk for shallow groundwater potable use scenarios are: aluminum, arsenic, cadmium, iron, manganese, thallium, and vanadium for noncarcinogenic hazards, and arsenic for carcinogenic risks. Only the background concentrations of iron, manganese and thallium were higher than the maximum concentrations of these metals detected at Site 5. Elimination of these three metals as COPCs from groundwater would still result in potential noncarcinogenic and carcinogenic risks. Additionally, there were several metals (arsenic, beryllium, cadmium,

lead, and thallium) with sporadic Maximum Contaminant Level (MCL) exceedances. However, concentrations of aluminum, beryllium, cadmium, lead, thallium, and vanadium fluctuate from round-to-round and the majority of elevated concentrations were detected in 1997 and 1999 at two monitoring wells (MW02S and MW03S) and not the most recent round of data collected in 2003.

A summary of each human health COPC and each parameter that exceeded the MCL in comparison to background is provided below.

- **Arsenic** – Arsenic concentrations pose potential unacceptable human health risks based on both the non-cancer RME and CTE estimates. Total and/or dissolved arsenic concentrations at MW01S, MW02S, and MW03S were above the background UTL for shallow groundwater and above the MCL at MW02S and MW03S in 1997 only. With the exception of dissolved arsenic concentrations detected above background at MW02S in 2003, all total and dissolved arsenic concentrations were below the MCL and background UTLs during subsequent monitoring.
- **Beryllium –** Total and dissolved beryllium concentrations were above the MCL and background UTL at both MW02S and MW03S. The human health risks were below EPA's acceptable risk ranges.
- **Cadmium –** Cadmium concentrations pose potential unacceptable human health risks based on the non-cancer RME estimate. Total and dissolved cadmium concentrations were also above the MCL and background UTL at both MW02S and MW03S in 1997 and in MW03S in 1999, but were below the MCL in the most recent monitoring event in 2003.
- **Iron –** Iron concentrations pose potential unacceptable human health risks based on both the non-cancer RME and CTE estimates. All total and dissolved iron concentrations (12,300 – 83,700 µg/l) were significantly below the background UTL (total - 107,000 µg/l, dissolved - 94,000 µg/l) for shallow groundwater.
- **Lead –** Total and dissolved lead concentrations were above the MCL (Action Level) and background UTL at both MW02S and MW03S. No potential for human health risks was identified. Additionally, the average total (7 µg/l) and dissolved (8 µg/l) lead concentrations across the site were below the action level (15 µg/l) for lead.
- **Manganese –** Manganese concentrations pose potential unacceptable human health risks based on both the non-cancer RME and CTE estimates. All total and dissolved manganese concentrations (950 – 4,320 µg/l) were significantly below the background UTL (total - 13,700 µg/l, dissolved - 11,800 µg/l) for shallow groundwater.
- **Thallium –** Thallium concentrations pose potential unacceptable human health risks based on the non-cancer RME estimate. Thallium was only detected at an estimated concentration in a duplicate sample from MW03S in 1997 and not repeated during subsequent monitoring in 1999 and 2003. Although the total thallium concentration (2.1 J µg/l) was slightly above the MCL (2 µg/l), the concentration was below the background UTL of 7.6 µg/l and dissolved thallium was not detected in shallow groundwater.

- **Vanadium –** Vanadium concentrations pose potential unacceptable human health risks based on the non-cancer RME estimate. Total and/or dissolved vanadium concentrations were only above the background UTLs at MW02S and MW03S in 1997 and not repeated in subsequent monitoring conducted in 1999 and 2003.

Summary of Deep Groundwater Quality

In the area of SJCA, the deep groundwater is not used as a potable water supply. There are no residence located downgradient of Site 5 as the site is bounded to the south by Blows Creek. Residence upgradient of Site 5 are supplied potable water by the City of Chesapeake. Deep aquifer groundwater is currently only used for irrigation upgradient of SJCA. Although future residential development of the site is improbable, deep groundwater was evaluated during the RI/HHRA/ERA under the future residential scenario.

Figure 1 shows the deep monitoring well locations. Table 3 provides the deep groundwater data collected to-date. A summary of the unacceptable human health risks from deep groundwater at Site 5 is provided on Table 4.

Potential noncarcinogenic hazards were identified from ingestion of iron by a current/future child resident and inhalation of chloroform through showering by a current/future adult resident (Table 4). However;

- **Chloroform -** was only detected in samples collected in July 1997 from MW01D and MW02D and not in subsequent monitoring rounds conducted in November 1997 and May 1999. The concentrations were below the MCL. Chloroform is a known potential lab contaminant that likely reflects artifacts of the analytical process.

- **Iron -** The RME non-cancer HI of 3 is above EPA's target HI of 1.0 and the CTE non-cancer HI is below 1.0 for ingestion by a current/future child resident. Although background UTLs have not been established for deep groundwater at SJCA, deep monitoring wells have been installed in locations representing anthropogenic conditions at SJCA (CH2M HILL, October 2001). The total and dissolved iron concentrations detected at Site 5 during the most recent round of sampling in 1999, were below the mean and maximum concentrations detected in the background monitoring wells.

There we no MCL exceedances in samples of deep groundwater from the latest round of samples collected from Site 5 in 1999. Additionally, the SJCA Project Management Team (Navy, EPA, VDEQ) determined the deep groundwater risks identified at Site 5 to be acceptable for all pathways and receptors.

Conclusion

Due to the variability in analytical results in shallow groundwater over time, the SJCA Project Management Team is currently planning to collect additional metals data from the existing monitoring wells and re-evaluating the potential risks to construction workers and future residents in Fiscal Year (FY) 2006. Antimony, arsenic, lead, selenium, and thallium will be analyzed by Inductively Coupled Plasma - Mass Spectrometry (ICPMS) to minimize the potential for false positive results. When shallow groundwater risks are re-evaluated in

FY 06, historical results determined to be false positive detections based on professional judgment, will not be included in the revised HHRA. Additionally, risk management decisions made by the SJCA Project Management Team will be considered in the revised risk evaluation. The analytical results and revised HHRA for shallow groundwater will be presented in an addendum to the Final Expanded RI/HHRA/ERA for Site 5.

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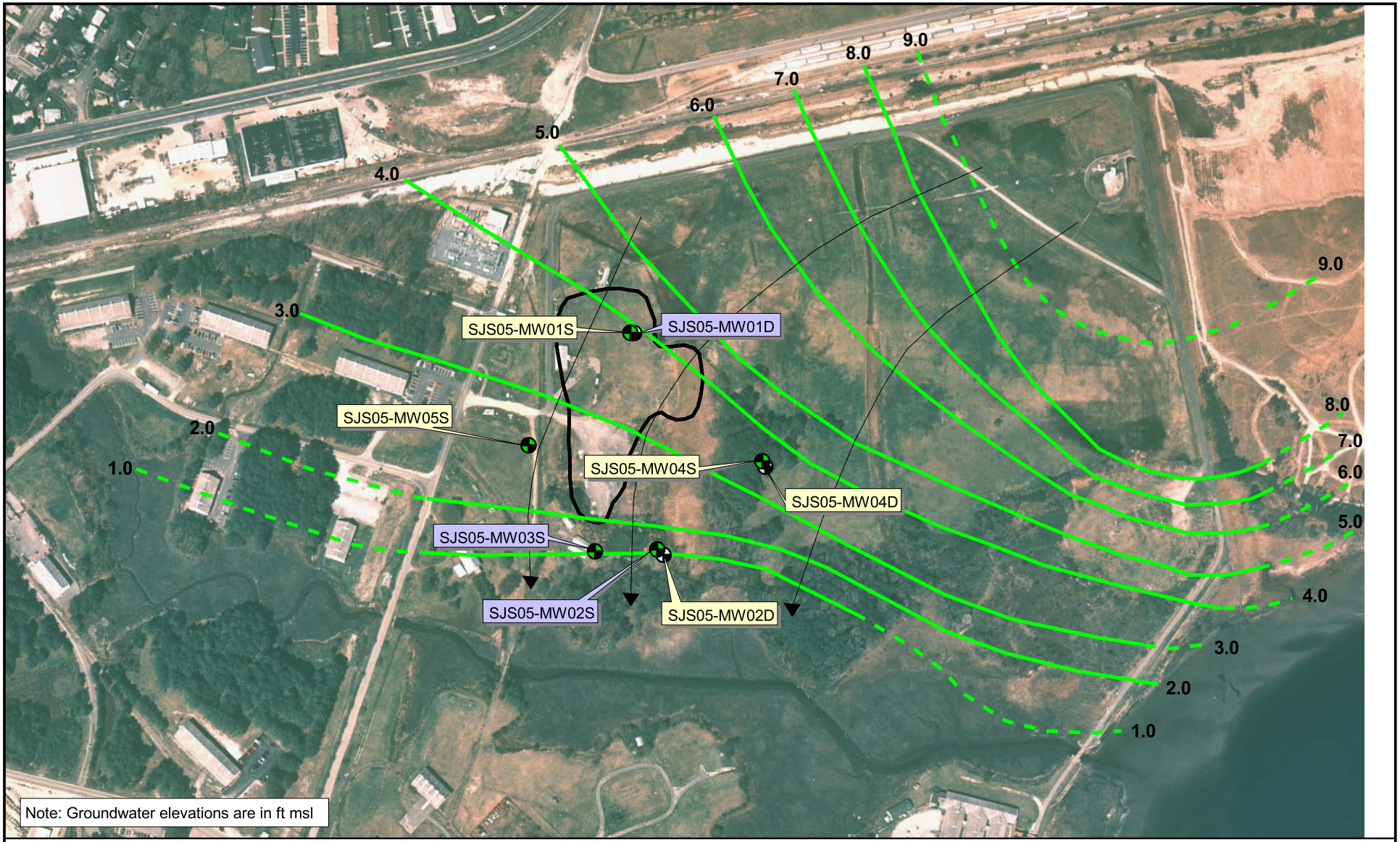

LEGEND

- Existing Deep Monitoring Well Locations
- Existing Shallow Monitoring Well Locations
- Site Boundary
- Monitoring Well To Be Sampled
- Contours of Columbia Aquifer Potentiometric Surface (August 16, 2001)
- Inferred Contours of Columbia Aquifer Potentiometric Surface (August 16, 2001)
- Groundwater Flow Direction

N

0 300 600 Feet

Figure 1
Site 5 Groundwater Sampling Locations
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

Table 1
Shallow Groundwater Detections and Exceedances of Screening Criteria
Site 5
St. Juliens Creek Annex
Chesapeake, Virginia

	Screening Criteria																	
Station ID				**SJS05-MW01S**			**SJS05-MW02S**					**SJS05-MW03S**					**SJS05-MW04S**	**SJS05-MW05S**
Sample ID	**RBC-Tap**	**MCL-Groundwater**	**95% Background UTL**	SJS05-GW1S-001	SJS05-GW1S-002	SJS05-GW1S-003	SJS05-GW2S-001	SJS05-GW2S-002	SJS05-GW2S-003	SJS05-MW02S-03D	SJS05-MW02S-03D-P	SJS05-GW3S-001	SJS05-GW3S-001P	SJS05-GW3S-002	SJS05-GW3S-003	SJS05-MW03S-03D	SJS05-GW4S-001	SJS05-GW5S-001
Sample Date				07/15/97	11/06/97	05/19/99	07/16/97	11/04/97	05/23/99	12/15/03	12/15/03	07/16/97	07/16/97	11/04/97	05/23/99	12/15/03	5/19/1999	05/23/99
Chemical Name																		
VOCs (UG/L)																		
2-Butanone	1,900	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	40.7 L	NA
Acetone	610	--	30.5	11 L	NA	NA	8 B	9 B	NA	NA	NA	NA	NA	7 B	NA	NA	***40.4 L***	NA
Carbon disulfide	1,000	--	0.64	1 U	1 U	0.400 B	1 U	***0.8 J***	0.300 B	NA	NA	1 U	0.3 J	1 U	0.300 B	NA	1.60 B	1 B
Toluene	750	1,000	0.2	0.2 J	1 U	1 U	1 U	1 U	1 U	NA	NA	1 U	1 U	1 U	1 U	NA	1 U	1 U
SVOCs (UG/L)																		
4-Methylphenol	180	--	--	10 U	10 U	12 U	10 U	10 U	11 U	NA	NA	10 U	10 U	10 U	11 U	NA	9 J	12 U
Di-n-butylphthalate	3,700	--	--	10 U	10 U	3 J	10 U	10 U	11 U	NA	NA	10 U	10 U	10 U	11 U	NA	4 J	12 U
Phenol	11,000	--	--	10 U	10 U	12 U	10 U	10 U	11 U	NA	NA	10 U	10 U	10 U	11 U	NA	3 J	12 U
bis(2-Ethylhexyl)phthalate	4.8	6	1	10 U	1 J	12 U	10 U	10 U	11 U	NA	NA	***2 J***	1 J	10 U	11 U	NA	12 U	12 U
Pest/PCBs (UG/L)																		
4,4'-DDD	0.28	--	--	0.1 U	0.1 U	0.110 U	0.1 U	0.1 U	0.120 U	NA	NA	0.1 U	0.1 U	0.1 U	0.110 U	NA	0.0110 J	0.0120 J
4,4'-DDT	0.2	--	--	0.1 U	0.1 U	0.110 U	0.1 U	0.1 U	0.120 U	NA	NA	0.1 U	0.1 U	0.1 U	0.110 U	NA	0.120 U	0.00520 J
Explosives (UG/L)																		
No Detections										NA	NA					NA		
Total Metals (UG/L)																		
Aluminum	37,000	--	1,710	1,630	60 B	89.7 J	1,110	***87,400***	***9,880***	***21,500***	***21,800***	***27,100***	***17,100***	***30,400***	***16,400***	***11,400***	613	362
Antimony	15	6	2.3	2 U	1.7 U	2.70 U	2 U	1.7 U	2.70 U	2 U	2 U	***3.7 J***	***6 J***	1.7 U	2.70 U	2 U	2.70 U	2.70 U
Arsenic	0.045	10	8	4.8 J	***8.8 J***	6 B	3 U	***12***	3.60 J	5.9 J	5.9 J	***27.3***	***18.4***	5.7 J	3.90 J	5.8 J	4.60 J	2 U
Barium	2,600	2,000	77.1	***359***	***248***	***249***	***126 J***	14 B	18.4 J	22.4 J	22.8 J	***77.8 J***	64.1 J	22 J	18.5 J	19.8 J	55.2 J	47.7 J
Beryllium	73	4	1.4	1 U	***1.7 J***	0.100 U	1 U	***18.3***	***4.5 J***	***5.4***	***5.5***	1.2 J	1 U	***13.5***	***9.10***	***7.6***	0.100 U	0.100 U
Cadmium	18	5	0.74	0.5 U	0.4 U	0.690 J	0.5 U	***9***	0.940 J	***2.2 J***	***2.1 J***	0.5 U	0.5 U	***11***	***5.70***	***4.8 J***	0.300 U	0.300 U
Calcium	--	--	531,000	117,000	182,000	188,000	97,800	66,300	54,100	57,000	58,200	53,200	49,700	40,700	37,300	65,600	257,000	174,000
Chromium	110	100	3.2	***8.5 J***	***11.4***	2 J	7 U	24.6 B	4.40 B	0.6 U	0.6 U	***58.7***	***36.1***	7.6 B	2.20 B	0.6 U	2.90 J	1.10 U
Cobalt	730	--	15.8	8 U	6 U	0.5 U	8 U	***257***	***66.9***	***62.6***	***62.9***	***41.5 J***	***33.4 J***	***141***	***90.2***	***72.5***	3.20 J	5.40 J
Copper	1,500	1,300	6.3	6 U	5.8 U	9.40 B	6 U	***124***	9.10 B	***19.1 J***	***20.1 J***	***12.8 J***	***11.2 J***	***62.2***	***25.1***	1.4 B	4 J	6.80 B
Iron	11,000	--	107,000	58,700	64,400	74,300	13,500	40,800	69,100	18,400	18,400	83,700	65,200	17,700	24,800	24,800	30,200	20,300
Lead	15	15	3.5	1 U	1.6 B	1.10 J	1.1 J	***16.2***	***4.70***	***9.4***	***9.8***	***19.2***	***13.5***	***26.1***	***18***	***6.4***	1 U	1.5 J
Magnesium	--	--	296,000	190,000	221,000	278,000	156,000	45,700	54,400	44,800	45,400	49,600	45,000	35,600	35,600	52,400	39,000	63,100
Manganese	730	--	13,700	1,300	2,720	3,080	992	4,320	2,640	2,040	2,060	2,980	2,670	3,620	3,400	3,870	1,360	3,320
Nickel	730	--	20.1	7 U	6.3 U	0.900 U	14.1 J	***360***	***106***	***102***	***103***	***46.5 K***	***41.1 K***	***238***	***160***	***121***	4.70 J	6.70 B
Potassium	--	--	85,400	39,500	72,300	***96,300***	49,100	13,000	23,600 J	15,100	15,900	13,200	11,100	15,000	15,400 J	29,500	21,200	9,460 J
Silver	180	--	1.9	2.4 B	2.5 B	0.900 U	3.8 B	***2.8 J***	0.900 U	0.81 J	0.48 J	4.1 B	6.9 B	1.5 J	0.900 U	1.4 J	0.900 U	0.900 U
Sodium	--	--	810,000	1,200,000 B	***1,340,000***	***1,480,000***	***1,340,000***	79,200	300,000	268,000	269,000	198,000	186,000	22,000	21,800	90,200	178,000	467,000
Thallium	2.6	2	7.6	2.7 B	1.8 B	10 U	2 U	1.5 U	3.20 U	2 U	2 U	2 U	2.1 J	1.5 U	3.20 U	2 U	2 U	3.20 U
Vanadium	260	--	13.7	11.4 J	6.8 U	0.600 U	9 U	9.9 J	0.630 J	3.2 J	3 J	***82.8***	***60.2***	6.8 U	0.600 U	1.3 J	0.600 U	0.600 U
Zinc	11,000	--	241	46.1	30.8 B	8.80 J	23.5 B	***2,020***	***572***	***764***	***774***	153	109	***1,540***	***1,240***	***957***	16.5 J	14.2 B
Dissolved Metals (UG/L)																		
Aluminum	37,000	--	399	44 U	38.1 U	167 J	44 U	***84,200***	***9,130***	***22,400***	***22,100***	44 U	72.3 B	***30,900***	***17,600***	***11,400***	***744***	71.1 B
Antimony	15	6	3.8	2 U	1.7 U	2.70 U	2 U	1.7 U	2.70 U	2 U	2 U	2 U	3.1 B	1.7 U	2.70 U	2 U	2.70 U	3.80 J
Arsenic	0.045	10	2.4	***3.1 J***	8.3 B	8.20 B	3 U	***13.3***	2 U	***6.9 J***	***6 J***	3 U	3 U	***5.8 J***	2 U	***6 J***	5.30 B	2 U
Barium	2,600	2,000	93.3	***371***	***250***	***243***	***120 J***	14.8 B	17.9 J	25.5 J	27.3 J	21.5 B	22.9 B	22.5 J	19.7 J	22.1 J	54.6 J	50.1 J
Beryllium	73	4	0.31	1 U	***0.58 J***	0.100 U	1 U	***17.7***	***4.40 J***	***5.8***	***5.5***	1 U	1 U	***14.1***	***9.70***	***7.5***	0.100 U	0.100 U
Cadmium	18	5	0.78	0.5 U	0.4 U	0.560 J	0.5 U	***8.5***	***1 J***	***2.4 J***	***2.3 J***	0.5 U	0.5 U	***11.5***	***6***	***5 J***	0.300 U	0.300 U
Calcium	--	--	464,000	118,000	179,000	188,000	94,800	63,700	52,000	60,300	58,800	68,400	68,500	41,100	40,000	65,300	211,000	172,000
Chromium	110	100	5.8	7 U	***9.2 J***	2.70 J	7 U	***33***	4.5 J	0.6 U	0.6 U	7 U	7 U	***21.8***	3.40 J	0.6 U	1.80 J	1.40 J
Cobalt	730	--	15	8 U	***36.8 J***	0.5 U	8 U	***270***	***65.9***	***64.4***	***64.1***	***22.3 J***	***19.2 J***	***173***	***94.9***	***71.6***	3.20 J	9.10 J
Copper	1,500	1,300	--	6 U	5.8 U	5 B	6 U	149	2.10 B	22.4 J	25.5	6 U	6 U	89.6	37.3	4.8 B	4.90 B	2.60 B
Iron	11,000	--	94,000	65,100	67,400	74,900	12,300	40,500	65,500	19,000 J	18,200 J	40,700	40,600	18,000	26,800	22,900 J	44,100	16,900
Lead	15	15	2.1	1 U	1.3 U	1 U	1 U	***20.2***	1 U	***12.7***	***10.6***	1 U	1.3 B	***29.3***	***20.4***	***7.8***	1 U	1 U
Magnesium	--	--	256,000	186,000	215,000	***276,000***	153,000	44,300	52,100	46,600 J	46,100 J	56,900	57,100	36,100	38,000	51,700 J	46,400	60,400
Manganese	730	--	11,800	1,290	2,560	3,080	950	4,200	2,500	2,120 J	2,090 J	3,140	3,150	3,670	3,640	3,790 J	1,620	3,130
Nickel	730	--	13.2	7 U	***18 J***	0.900 U	7.4 K	***353***	***103***	***105***	***104***	***13.5 K***	***14.1 K***	***248***	***169***	***121***	3.80 B	11.3 J
Potassium	--	--	73,300	37,100	68,900	***94,700***	47,800	12,500	22,500 J	16,800 J	16,700 J	9,250	9,570	15,000	16,200 J	29,100 J	21,200	9,680 J
Silver	180	--	2.4	2.1 B	1.3 B	0.900 U	4.5 B	1.1 U	0.900 U	0.53 J	0.8 J	3.7 B	6 B	1.1 U	0.900 U	1.6 J	0.900 U	1.40 J
Sodium	--	--	582,000	***1,170,000***	***1,310,000***	***1,450,000***	***1,290,000***	76,300	291,000	273,000	270,000	249,000	250,000	22,000	22,700	87,700	244,000	447,000
Vanadium	260	--	7.1	9 U	6.8 U	0.600 U	9 U	***8.8 J***	1 J	2.8 J	2.9 J	9 U	9 U	***7.6 J***	0.600 J	0.72 J	0.600 U	0.600 U
Zinc	11,000	--	109	36.6 B	60 B	13.9 J	28.5 B	***1,980***	***556***	***810***	***772***	39.9 B	41.5 B	***1,600***	***1,330***	***940***	11.5 J	32.6 B

Potential human health risk drivers

Exceeds Background UTL

Exceeds RBC-Tap

Exceeds MCL-Groundwater

B - Analyte not detected above associated blank

J - Reported value is estimated

K - Reported value may be biased high

NA - Not Analyzed

ND - Compounds were analyzed but not detected during Background Investigation

NS - Compounds not analyzed during Background Investigation

L - Reported value may be biased low

U - Analyte not detected

Table 2
Summary of Shallow Groundwater Risks
Site 5
St. Juliens Creek Annex
Chesapeake, Virginia

Receptor	Exposure Route	Cancer Risk	Chemicals with Cancer Risks >10^{-4}	Hazard Index	Chemicals with Hazard Index >1
Reasonable Maximum Exposure					
Future Adult Construction Worker	Dermal Contact	$5x10^{-9}$		0.1	
	Total	**$5x10^{-9}$**		**0.1**	
Future Child Resident	Ingestion	NA		39	Aluminum (3.1), Arsenic (2.3), Cadmium (1.4), Iron (11), Manganese (14), Thallium (1.9), Vanadium (1.8)
	Dermal Contact	NA		3.8	Manganese (2.3)
	Inhalation	NA		NA	
	Total	**NA**		**43**	
Future Lifetime Resident (Child/Adult)	Ingestion	$2.4x10^{-4}$	Arsenic	NA	
	Dermal Contact	$2.2x10^{-11}$		NA	
	Inhalation	NA		NA	
	Total	**$2.4x10^{-4}$**		**NA**	
Central Tendency Exposure					
Future Child Resident	Ingestion	NA		15.8	Iron (5.9), Manganese (5.9)
	Dermal Contact	NA		0.4	
	Inhalation	NA		NA	
	Total	**NA**		**16.3**	
Future Lifetime Resident (Child/Adult)	Ingestion	$5.4x10^{-5}$		NA	
	Dermal Contact	$1.3x10^{-7}$		NA	
	Inhalation	NA		NA	
	Total	**$5.4x10^{-5}$**		**NA**	

Table 3
Deep Groundwater Detections and
Exceedances of Screening Criteria
Site 5
St. Juliens Creek Annex
Chesapeake, Virginia

	Screening Criteria												
Station ID					**SJS05-MW01D**				**SJS05-MW02D**			**SJS05-MW04D**	
Sample ID	**RBC-Tap**	**MCL-Groundwater**	**BACKGROUND**		SJS05-GW1D-001	SJS05-GW1D-002	SJS05-GW1D-003	SJS05-MW01D-03D[1]	SJS05-GW2D-001	SJS05-GW2D-002	SJS05-GW2D-003	SJS05-GW4D-001	SJS05-GW4D-001P
Sample Date			**Mean**	**Max**	07/24/97	11/06/97	05/19/99	12/15/03	07/30/97	11/04/97	05/23/99	5/19/1999	5/19/1999
Chemical Name													
VOCs (UG/L)													
Carbon disulfide	1,000	--	ND	ND	1 U	0.2 J	2 B	NA	1 U	1 U	0.300 B	6	0.700
Chloroform	0.15	80	ND	ND	2	1 U	1 U	NA	5	0.7 B	1 U	1.40 B	1.40 B
SVOCs (UG/L)													
bis(2-Ethylhexyl)phthalate	4.8	6	4.0	1	10 U	10 U	11 UL	NA	10 U	10 U	12 U	1 J	2 J
Pest/PCBs (UG/L)													
4,4'-DDT	0.2	--	NS	NS	0.1 U	0.1 U	0.00570 J	NA	0.1 U	0.1 U	0.110 U	0.110 U	0.110 U
Heptachlor	0.015	0.4	NS	NS	0.05 U	0.05 U	0.0570 U	NA	0.05 U	0.05 U	0.0570 U	0.0540 U	0.0330 J
Explosives (UG/L)													
RDX	0.61	--	NS	NS	NA	NA	1.60 J	Not Detected	NA	NA	2.60 U	2.60 U	2.60 U
Total Metals (UG/L)													
Aluminum	37,000	--	67.9	133	1,070 J	38.1 U	38.2 U	NA	2,250	177 B	42.3 J	183 J	84.3 J
Antimony	15	6	ND	ND	NA	1.7 U	2.70 U	NA	3.1 J	1.7 U	3.20 J	2.70 U	2.70 U
Arsenic	0.045	10	ND	ND	3 U	3.2 U	3 B	NA	4.9 J	3.2 U	2 U	5.5 B	5.30 B
Barium	2,600	2,000	24.7	32.7	15 B	12.2 B	24.2 J	NA	26.5 J	22 J	20.6 J	24.4 J	24 J
Beryllium	73	4	ND	ND	1.4 B	0.58 U	0.100 U	NA	1.5 K	0.58 U	0.100 U	0.100 U	0.100 U
Calcium	--	--	61,933	75,200	58,700 J	51,600	78,500	NA	68,700	64,000	65,900	71,900	70,600
Chromium	110	100	ND	ND	10.1 J	4.6 U	1.30 J	NA	13 B	4.6 U	1.10 U	1.10 U	1.10 U
Iron	11,000	--	907.7	1,670	1,460 J	109 B	337	NA	4,420 K	1,150	1,120	325	291
Magnesium	--	--	6,630	12,000	4,770 J	3,750 J	8,030	NA	10,000	10,500	9,890	11,100	10,900
Manganese	730	--	177.7	226	30.7 B	14.4 B	52.4	NA	142	178	192	118	115
Nickel	730	--	0.7	1.1	7 U	6.3 U	1.70 B	NA	7 U	6.3 U	0.900 U	1.30 B	1.5 J
Potassium	--	--	4,817	8,490	8,030	7,440	8,570	NA	7,740	7,550	7,170 J	9,070	8,920
Sodium	--	--	30,233	39,900	39,000 J	41,200	45,600	NA	43,000	43,800	45,300	53,000	52,100
Vanadium	260	--	0.4	0.68	9 U	6.8 U	0.600 U	NA	15.6 K	6.8 U	0.600 U	0.600 U	0.600 U
Zinc	11,000	--	3.5	4.8	11.4 B	4.8 B	2.10 J	NA	14.4 B	14.5 B	3.10 J	4.30 J	4.40 J
								NA					
Dissolved Metals (UG/L)								NA					
Aluminum	37,000	--	33.8	63.1	108 B	38.1 U	189 J	NA	56 B	38.1 U	45.4 J	205	38.2 U
Antimony	15	6	ND	ND	2 UL	1.7 U	2.70 U	NA	2 J	1.7 U	2.70 U	2.70 U	2.70 U
Barium	2,600	2,000	23.0	31.2	11.6 B	11.4 B	23.9 J	NA	20.4 B	19.4 B	23.3 J	23.6 J	23.2 J
Calcium	--	--	57,667	77,700	65,800 J	44,700	76,800	NA	58,900	59,200	74,600	69,500	68,500
Cobalt	730	--	ND	ND	8 U	6 U	0.5 U	NA	8 U	6 U	0.5 U	0.540 J	0.5 U
Iron	11,000	--	788.7	1,360	40.7 B	67.5 B	286	NA	454	848	1,230	286	257
Lead	15	15	ND	ND	1.4 B	1.3 U	1 U	NA	1.7 J	1.8 B	1 U	1 U	1 U
Magnesium	--	--	5,967	10,000	5,240 J	2,820 J	7,910	NA	9,360	9,850	11,200	10,800	10,600
Manganese	730	--	161.3	188	10.1 B	13.6 B	50.8	NA	100	166	217	113	106
Nickel	730	--	1.3	2.3	7 U	6.3 U	0.900 U	NA	7 U	6.3 U	0.900 U	1.30 J	1.5 J
Potassium	--	--	4,407	7,200	8,860	6,960	8,360	NA	7,590	6,780	8,240 J	8,810	8,880
Sodium	--	--	28,400	37,900	44,100 J	37,900	45,400	NA	44,900	41,400	51,400	51,400	51,100
Zinc	11,000	--	6.1	10.5	55.1 B	8.1 B	1.90 U	NA	13.4 B	10.3 B	4.10 B	3.10 J	7.30 J

Potential human health risk drivers
Exceeds RBC-Tap
Exceeds MCL-Groundwater
NA - Not Analyzed
NS - Compounds not analyzed during Background Investigation
ND - Compounds were analyzed but not detected during Background Investigation
J - Reported value is estimated
K - Reported value may be biased high
U - Analyte not detected

Table 3
Deep Groundwater Detections and
Exceedances of Screening Criteria
Site 5
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	RBC-Tap	MCL-Groundwater	BACKGROUND		SJS05-MW01D				SJS05-MW02D			SJS05-MW04D	
Sample ID					SJS05-GW1D-001	SJS05-GW1D-002	SJS05-GW1D-003	SJS05-MW01D-03D[1]	SJS05-GW2D-001	SJS05-GW2D-002	SJS05-GW2D-003	SJS05-GW4D-001	SJS05-GW4D-001P
Sample Date			Mean	Max	07/24/97	11/06/97	05/19/99	12/15/03	07/30/97	11/04/97	05/23/99	5/19/1999	5/19/1999
Chemical Name													

B - Analyte not detected above associated blank

Table 4
Summary of Deep Groundwater Risks
Site 5
St. Juliens Creek Annex
Chesapeake, Virginia

Receptor	Exposure Route	Cancer Risk	Chemicals with Cancer Risks >10^{-4}	Hazard Index	Chemicals with Hazard Index >1
Reasonable Maximum Exposure					
Current/Future Adult Resident	Ingestion	NA		1	
	Dermal Contact	NA		0.02	
	Inhalation	$8x10^{-6}$		3	Chloroform
	Total	**$8x10^{-6}$**		**5**	
Current/Future Child Resident	Ingestion	NA		3	Iron
	Dermal Contact	NA		0.04	
	Inhalation	NA		NA	
	Total	**NA**		**3**	
Current/Future Lifetime Resident (Child/Adult)	Ingestion	$9.0x10^{-5}$		NA	
	Dermal Contact	$3.0x10^{-6}$		NA	
	Inhalation	$8.0x10^{-6}$		NA	
	Total	**$1.0x10^{-4}$**		**NA**	
Central Tendency Exposure					
Current/Future Adult Resident	Ingestion	NA		NA	
	Dermal Contact	NA		NA	
	Inhalation	NA		2	Chloroform
	Total	**NA**		**2**	
Current/Future Child Resident	Ingestion	NA		0.7	
	Dermal Contact	NA		0.008	
	Inhalation	NA		NA	
	Total	**NA**		**0.7**	
Current/Future Lifetime Resident (Child/Adult)	Ingestion	$2.0x10^{-5}$		NA	
	Dermal Contact	$1.0x10^{-6}$		NA	
	Inhalation	NA		NA	
	Total	**$2.0x10^{-5}$**		**NA**	

Summary of Data Quantitatively Used in Risk Assessment
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Medium	Date of Sampling	Sample Location	Sample	Parameters
Shallow Groundwater (un-filtered groundwater)				
Site 5	07/15/97	SJS05-MW01S	SJS05-GW1S-001	METAL
	11/06/97	SJS05-MW01S	SJS05-GW1S-002	METAL
	05/19/99	SJS05-MW01S	SJS05-GW1S-003	METAL
	07/16/97	SJS05-MW02S	SJS05-GW2S-001	METAL
	11/04/97	SJS05-MW02S	SJS05-GW2S-002	METAL
	05/23/99	SJS05-MW02S	SJS05-GW2S-003	METAL
	12/15/03	SJS05-MW02S	SJS05-MW02S-03D	METAL
	12/15/03	SJS05-MW02S	SJS05-MW02S-03D-P	METAL
	07/16/97	SJS05-MW03S	SJS05-GW3S-001	METAL
	07/16/97	SJS05-MW03S	SJS05-GW3S-001P	METAL
	11/04/97	SJS05-MW03S	SJS05-GW3S-002	METAL
	05/23/99	SJS05-MW03S	SJS05-GW3S-003	METAL
	12/15/03	SJS05-MW03S	SJS05-MW03S-03D	METAL
	5/19/1999	SJS05-MW04S	SJS05-GW4S-001	METAL
	05/23/99	SJS05-MW05S	SJS05-GW5S-001	METAL

Summary of COPCs for the HHRA
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia
Groundwater

Shallow Aquifer-Tap Water (un-filtered groundwater)
Aluminum
Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium
Cobalt
Iron
Lead
Manganese
Nickel
Thallium
Vanadium
Zinc

Potentially Complete Human Health Exposure Pathways
Conceptual Site Model
Site 5
St. Juliens Creek Annex, Chesapeake, Virginia

Land Use	Contaminated Media	Potentially Exposed Populations	Exposure Route (Human Health)	Pathway Selected for Evaluation	Rationale
Future					
Residential	Groundwater	Residents - Lifetime and Children	Ingestion, dermal contact and inhalation	Yes	Although unlikely, groundwater could be used as a potable water supply in the future

TABLE 1

SELECTION OF EXPOSURE PATHWAYS

Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
	Groundwater	Shallow Groundwater	Tap Water	Resident	Child	Dermal	On-Site	Quant	Although unlikely, future resident may use shallow groundwater as a potable source
						Ingestion	On-Site	Quant	Although unlikely, future resident may use shallow groundwater as a potable source
					Adult/Child	Dermal	On-Site	Quant	Although unlikely, future resident may use shallow groundwater as a potable source
						Ingestion	On-Site	Quant	Although unlikely, future resident may use shallow groundwater as a potable source
		Air	Shallow Aquifer - Water Vapors at Showerhead	Resident	Child	Inhalation	On-site	None	Children are assumed not to shower.
					Adult/Child	Inhalation	On-site	Quant	Lifetime resident will be assumed to shower since children are assumed not to shower.

Table 2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 5, St. Juliens Creek Annex, Chesapeake, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Tap water (Unfiltered)	78-93-3	2-Butanone	4.07E+01 L	4.07E+01 L	UG/L	SJS05-GW4S-001	1/1	5 - 5	4.07E+01	NA	6.97E+02 N	NA		NO	BSL
	67-64-1	Acetone	1.10E+01 L	4.04E+01 L	UG/L	SJS05-GW4S-001	2/5	5 - 5	4.04E+01	NA	5.48E+02 N	NA		NO	BSL
	75-15-0	Carbon disulfide	3.00E-01 J	8.00E-01 J	UG/L	SJS05-GW2S-002	2/11	1 - 1	8.00E-01	NA	1.04E+02 N	NA		NO	BSL
	108-88-3	Toluene	2.00E-01 J	2.00E-01 J	UG/L	SJS05-GW1S-001	1/11	1 - 1	2.00E-01	NA	7.47E+01 N	1000	PMCL	NO	BSL
	106-44-5	4-Methylphenol	9.00E+00 J	9.00E+00 J	UG/L	SJS05-GW4S-001	1/11	10 - 12	9.00E+00	NA	1.83E+01 N	NA		NO	BSL
	84-74-2	Di-n-butylphthalate	3.00E+00 J	4.00E+00 J	UG/L	SJS05-GW4S-001	2/11	10 - 12	4.00E+00	NA	3.65E+02 N	NA		NO	BSL
	108-95-2	Phenol	3.00E+00 J	3.00E+00 J	UG/L	SJS05-GW4S-001	1/11	10 - 12	3.00E+00	NA	1.10E+03 N	NA		NO	BSL
	117-81-7	bis(2-Ethylhexyl)phthalate	1.00E+00 J	2.00E+00 J	UG/L	SJS05-GW3S-001	2/11	10 - 12	2.00E+00	NA	4.78E+00 C	400	PMCL	NO	BSL
	72-54-8	4,4'-DDD	1.10E-02 J	1.20E-02 J	UG/L	SJS05-GW5S-001	2/11	0.1 - 0.12	1.20E-02	NA	2.79E-01 C	NA		NO	BSL
	50-29-3	4,4'-DDT	5.20E-03 J	5.20E-03 J	UG/L	SJS05-GW5S-001	1/11	0.1 - 0.13	5.20E-03	NA	1.97E-01 C	NA		NO	BSL
	7429-90-5	Aluminum	8.97E+01 J	8.74E+04 J	UG/L	SJS05-GW2S-002	12/13	29 - 200	8.74E+04	1.71E+03	3.65E+03 N	50-200	SMCL	YES	ASL
	7440-36-0	Antimony	6.00E+00 J	6.00E+00 J	UG/L	SJS05-GW3S-001	1/13	1 - 60	6.00E+00	2.30E+00	1.46E+00 N	6	PMCL	YES	ASL
	7440-38-2	Arsenic	3.60E+00 J	2.73E+01 J	UG/L	SJS05-GW3S-001	10/13	2 - 10	2.73E+01	8.00E+00	4.46E-02 C	10	PMCL	YES	ASL
	7440-39-3	Barium	1.84E+01 J	3.59E+02 J	UG/L	SJS05-GW1S-001	12/13	0.20 - 200	3.59E+02	7.71E+01	2.56E+02 N	2000	PMCL	YES	ASL
	7440-41-7	Beryllium	1.20E+00 J	1.83E+01 J	UG/L	SJS05-GW2S-002	8/13	0.10 - 5	1.83E+01	1.40E+00	7.30E+00 N	4	PMCL	YES	ASL
	7440-43-9	Cadmium	6.90E-01 J	1.10E+01 J	UG/L	SJS05-GW3S-002	7/13	0.3 - 5	1.10E+01	7.40E-01	1.83E+00 N	5	PMCL	YES	ASL
	7440-70-2	Calcium	3.73E+04 J	2.57E+05 J	UG/L	SJS05-GW4S-001	13/13	46 - 5,000	2.57E+05	5.31E+05	NA	NA		NO	BSL
		Chromium (total)	2.00E+00 J	5.87E+01 J	UG/L	SJS05-GW3S-001	5/13	1.10 - 10	5.87E+01	3.20E+00	1.10E+01	100	PMCL	YES	ASL
	7440-48-4	Cobalt	3.20E+00 J	2.57E+02 J	UG/L	SJS05-GW2S-002	9/13	0.5 - 50	2.57E+02	1.58E+01	7.30E+01 N	NA	PMCL	YES	ASL
	7440-50-8	Copper	4.00E+00 J	1.24E+02 J	UG/L	SJS05-GW2S-002	6/13	1.10 - 25	1.24E+02	6.30E+00	1.46E+02 N	1300	PMCL	NO	BSL
	7439-89-6	Iron	1.35E+04 J	8.37E+04 J	UG/L	SJS05-GW3S-001	13/13	5 - 100	8.37E+04	1.07E+05	1.10E+03 N	300	SMCL	YES	ASL
	7439-92-1	Lead	1.10E+00 J	2.61E+01 J	UG/L	SJS05-GW3S-002	10/13	1 - 3	2.61E+01	3.50E+00	1.50E+01	15	PMCL	YES	ASL
	7439-95-4	Magnesium	3.56E+04 J	2.78E+05 J	UG/L	SJS05-GW1S-003	13/13	24.30 - 5,000	2.78E+05	2.96E+05	NA			NO	BSL
	7439-96-5	Manganese	9.92E+02 J	4.32E+03 J	UG/L	SJS05-GW2S-002	13/13	0.30 - 15	4.32E+03	1.37E+04	7.30E+01 N	50	SMCL	YES	ASL
	7440-02-0	Nickel	4.70E+00 J	3.60E+02 J	UG/L	SJS05-GW2S-002	9/13	0.90 - 40	3.60E+02	2.01E+01	7.30E+01 N	NA		YES	ASL
	7440-09-7	Potassium	9.46E+03 J	9.63E+04 J	UG/L	SJS05-GW1S-003	13/13	13.5 - 5,000	9.63E+04	8.54E+04	NA	NA		NO	BSL
	7440-22-4	Silver	8.10E-01 J	2.80E+00 J	UG/L	SJS05-GW2S-002	4/13	0.90 - 10	2.80E+00	1.90E+00	1.83E+01 N	NA		NO	BSL
	7440-23-5	Sodium	2.18E+04 J	1.48E+06 J	UG/L	SJS05-GW1S-003	12/13	28 - 5,000	1.48E+06	8.10E+05	NA	NA		NO	BSL
	7440-28-0	Thallium	2.10E+00 J	2.10E+00 J	UG/L	SJS05-GW3S-001P	1/13	1.5 - 10	2.10E+00	7.60E+00	2.56E-01 N	2	PMCL	YES	ASL
	7440-62-2	Vanadium	6.30E-01 J	8.28E+01 J	UG/L	SJS05-GW3S-001	6/13	0.60 - 50	8.28E+01	1.37E+01	3.65E+00 N	NA		YES	ASL
	7440-66-6	Zinc	8.80E+00 J	2.02E+03 J	UG/L	SJS05-GW2S-002	10/13	1.90 - 20	2.02E+03	2.41E+02	1.10E+03 N	5000	SMCL	YES	ASL

[1] Minimum and maximum concentration of unfiltered metals were used to screen chemicals in tap water screening (residential), as per the 1991 USEPA *Region III Technical Guidance Manual: Exposure Point Concentrations in Groundwater* (EPA/903/8-91/002).

[2] Unfiltered background values are presented in a 2004 *Final Background Investigation Report Addendum for Groundwater*.

[3] Risk-Based Concentration Table for Tap Water, October 8, 2004, U.S. EPA Region III, Jennifer Hubbard.
RBC value for chromium VI used for total chromium.
Lead screening toxicity value is 15 ug/L, the Safe Drinking Water Act action level for lead.
RBC value for manganese-nonfood used as surrogate for manganese.
RBC value for mercuric chloride used as surrogate for mercury.

[4] Rationale Codes

Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SQL = Sample Quantification Limit

COPC = Chemical of Potential Concern

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered

J = Estimated Value

K = Biased High

L = Biased Low

SMCL = Maximum Contaminant Level, Secondary Drinking Water Standards

PMCL = Maximum Contaminant Level, Primary Drinking Water Standards

AL = Action Level, Safe Drinking Water Act, Summer 2000.

TABLE 3.1.RME

EXPOSURE POINT CONCENTRATION SUMMARY

REASONABLE MAXIMUM EXPOSURE

SITE 5, ST. JULIENS CREEK ANNEX, CHESAPEAKE, VIRGINIA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)		Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Shallow Aquifer - Tap Water	Aluminum	ug/L	1.60E+04	4.89E+04	(G)	8.74E+04	4.89E+04	ug/L	Adj. Gamma	(1,3,4)
	Antimony	ug/L	1.48E+00	3.14E+00	(NP)	6.00E+00 J	3.14E+00	ug/L	95%-Cheb-m	(5)
	Arsenic	ug/L	6.76E+00	1.06E+01	(G)	2.73E+01	1.06E+01	ug/L	App. Gamma	(1,3,4)
	Barium	ug/L	9.78E+01	1.84E+02	(G)	3.59E+02	1.84E+02	ug/L	App. Gamma	(1,3,4)
	Beryllium	ug/L	4.81E+00	1.32E+01	(G)	1.83E+01	1.32E+01	ug/L	Adj. Gamma	(1,3,4)
	Cadmium	ug/L	2.74E+00	1.72E+01	(NP)	1.10E+01	1.10E+01	ug/L	Max	(1,7)
	Chromium (total)	ug/L	8.27E+00	1.84E+01	(G)	5.87E+01	1.84E+01	ug/L	App. Gamma	(1,3,4)
	Cobalt	ug/L	5.78E+01	1.35E+02	(G)	2.57E+02	1.35E+02	ug/L	App. Gamma	(1,3,4)
	Iron	ug/L	4.16E+04	5.39E+04	(N)	8.37E+04	5.39E+04	ug/L	95% UCL-N	(2)
	Lead	ug/L	8.15E+00	8.15E+00		2.61E+01	8.15E+00	ug/L	Mean-N	(8)
	Manganese	ug/L	2.74E+03	3.26E+03	(N)	4.32E+03	4.32E+03	ug/L	95% UCL-N	(2)
	Nickel	ug/L	8.95E+01	2.45E+02	(G)	3.60E+02	2.45E+02	ug/L	Adj. Gamma	(1,3,4)
	Thallium	ug/L	1.51E+00	2.87E+00	(NP)	2.10E+00 J	2.10E+00	ug/L	Max	(5,7)
	Vanadium	ug/L	9.36E+00	2.77E+01	(G)	8.28E+01	2.77E+01	ug/L	App. Gamma	(1,4)
	Zinc	ug/L	5.66E+02	1.66E+03	(G)	2.02E+03	2.02E+03	ug/L	Adj. Gamma	(3,4)

Full statistics for data included in Appendix .

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.

ProUCL, Version 3.0 used to determine distribution of data using the Shapiro-Wilk W Test. ProUCL used to calculate RME EPC, following recommendations based on distribution and standard deviation in users guide (USEPA. April 2004. ProUCL, Version 3.0. Prepared by Lockheed Martin Environmental Services).

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data, H-Statistic (95% UCL-T); 95% Chebyshev (MVUE) UCL (95% Cheb); 99% Chebyshev (MVUE) UCL (99% Cheb); 95% Chebyshev (mean,std) UCL (95% Cheb-m); 97.5% Chebyshev (mean,std) UCL (97.5% Cheb-m); 99% Chebyshev (mean,std) UCL (99% Cheb-m); Mean of Log-transformed Data using the Minimum Variance Unbiased Estimate (MVUE) method (Mean-T), 95% modified-t UCL adjusted for skewness (95% Mod-t); 95% Student's-T test UCL (95% Stud-t); 95% Hall's Bootdtrap UCL (95% Hall); 95% Approximate Gamma (App. Gamma); 95% Adjusted Gamma (Adj. Gamma).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.

(2) Shapiro-Wilk W Test indicates data are normally distributed.

(3) Anderson-Darling Test indicates data are gamma distributed.

(4) Kolmogorov-Smirnov Test indicates data are gamma distributed.

(5) Distribution tests are inconclusive (data are not normal, log-normal, or gamma-distributed).

(6) Shapiro-Wilk W Test indicates data fit both log-normal and normal distribution. Select distribution with higher W Test result.

(7) The maximum detected concentration was used as the UCL because the value recommended by ProUCL 3.0 was higher than the Max.

(8) The average concentration is used as the RME EPC, which is then used as an input into the USEPA's IEUBK model to determine risks to receptors from exposure to lead. if the average concentration is greater than the Federal action level for lead (15 ug/L).

mg/kg = Milligrams per kilogram.

G = Gamma distribution.

N = Normal distribution.

T = Log-normal distribution.

NP = Non-Parametric distribution.

J - Analyte present. Reported value may or may not be accurate or precise.

K = Biased High

L = Biased Low

TABLE 3.1.CT

EXPOSURE POINT CONCENTRATION SUMMARY

CENTRAL TENDENCY EXPOSURE

SITE 5, ST. JULIENS CREEK ANNEX, CHESAPEAKE, VIRGINIA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)		Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Shallow Aquifer - Tap Water	Aluminum	ug/L	2.E+04	5.E+04	(G)	8.74E+04	1.60E+04	ug/L	Mean-N	(1,3,4)
	Antimony	ug/L	1.E+00	3.E+00	(NP)	6.00E+00 J	1.48E+00	ug/L	Mean-N	(5)
	Arsenic	ug/L	7.E+00	1.E+01	(G)	2.73E+01	6.76E+00	ug/L	Mean-N	(1,3,4)
	Barium	ug/L	1.E+02	2.E+02	(G)	3.59E+02	8.38E+01	ug/L	Mean-N	(1,3,4)
	Beryllium	ug/L	5.E+00	1.E+01	(G)	1.83E+01	4.81E+00	ug/L	Mean-N	(1,3,4)
	Cadmium	ug/L	3.E+00	2.E+01	(NP)	1.10E+01	2.74E+00	ug/L	Mean-N	(2,7)
	Chromium (total)	ug/L	8.E+00	2.E+01	(G)	5.87E+01	8.27E+00	ug/L	Mean-N	(1,3,4)
	Cobalt	ug/L	6.E+01	1.E+02	(G)	2.57E+02	5.78E+01	ug/L	Mean-N	(1,3,4)
	Iron	ug/L	4.E+04	5.E+04	(N)	8.37E+04	4.16E+04	ug/L	Mean-N	(2)
	Lead	ug/L	8.E+00	8.E+00		2.61E+01	8.15E+00	ug/L	Mean-N	(9)
	Manganese	ug/L	3.E+03	3.E+03	(N)	4.32E+03	2.74E+03	ug/L	Mean-N	(2)
	Nickel	ug/L	9.E+01	2.E+02	(G)	3.60E+02	8.95E+01	ug/L	Mean-N	(1,3,4)
	Thallium	ug/L	2.E+00	3.E+00	(NP)	2.10E+00 J	1.51E+00	ug/L	Mean-N	(5)
	Vanadium	ug/L	9.E+00	3.E+01	(G)	8.28E+01	9.36E+00	ug/L	Mean-N	(1,3,4)
	Zinc	ug/L	6.E+02	2.E+03	(G)	2.02E+03	5.66E+02	ug/L	Mean-N	(3,4)

Full statistics for data included in Appendix .

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.

ProUCL, Version 3.0 used to determine distribution of data using the Shapiro-Wilk W Test. ProUCL used to calculate RME EPC, following recommendations based on distribution and standard deviation in users guide (USEPA. April 2004. ProUCL, Version 3.0. Prepared by Lockheed Martin Environmental Services).

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data, H-Statistic (95% UCL-T); 95% Chebyshev (MVUE) UCL (95% Cheb); 99% Chebyshev (MVUE) UCL (99% Cheb); 95% Chebyshev (mean,std) UCL (95% Cheb-m); 97.5% Chebyshev (mean,std) UCL (97.5% Cheb-m); 99% Chebyshev (mean,std) UCL (99% Cheb-m); Mean of Log-transformed Data using the Minimum Variance Unbiased Estimate (MVUE) method (Mean-T), 95% modified-t UCL adjusted for skewness (95% Mod-t); 95% Student's-T test UCL (95% Stud-t); 95% Hall's Bootdtrap UCL (95% Hall); 95% Approximate Gamma (App. Gamma); 95% Adjusted Gamma (Adj. Gamma).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.

(2) Shapiro-Wilk W Test indicates data are normally distributed.

(3) Anderson-Darling Test indicates data are gamma distributed.

(4) Kolmogorov-Smirnov Test indicates data are gamma distributed.

(5) Distribution tests are inconclusive (data are not normal, log-normal, or gamma-distributed).

(6) Shapiro-Wilk W Test indicates data fit both log-normal and normal distribution. Select distribution with higher W Test result.

(7) The maximum detected concentration was used as the UCL because the value recommended by ProUCL 3.0 was higher than the Max.

(8) The maximum detected concentration was used as the UCL because n<5.

(9) The average concentration is used as the CTE EPC, which is then used as an input into the USEPA's IEUBK model to determine risks to receptors from exposure to lead.

mg/kg = Milligrams per kilogram.

G = Gamma distribution.

N = Normal distribution.

T = Log-normal distribution.

NP = Non-Parametric distribution.

J - Analyte present. Reported value may or may not be accurate or precise.

K = Biased High

L = Biased Low

TABLE 4.1.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
SITE 5, ST. JULIENS CREEK ANNEX, CHESAPEAKE, VIRGINIA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Child	Upper Aquifer-Tap Water	CW	Chemical Concentration in Water	See Table 3.1.RME		See Table 3.1.RME	CDI (mg/kg-day) =
				IR-W	Ingestion Rate of Water	1	liters/day	EPA, 1997	CW x IR-W x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	6	years	EPA, 1991	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
		Child/Adult	Upper Aquifer-Tap Water	CW	Chemical Concentration in Water	See Table 3.1.RME		See Table 3.1.RME	CDI (mg/kg-day) =
				IR-W-A	Ingestion Rate of Water, Adult	2	liters/day	EPA, 1997	CW x IR-W-Adj x EF x CF1 x 1/AT
				IR-W-C	Ingestion Rate of Water, Child	1	liters/day	EPA, 1997	
				IR-W-Adj	Ingestion Rate of Water, Age-adjusted	1.09	liter-year/kg-day	calculated	IR-W-Adj (liter-year/kd-day) =
				EF	Exposure Frequency	350	days/year	EPA, 1991	(ED-C x IR-W-C / BW-C) +
				ED-A	Exposure Duration, Adult	24	years	EPA, 1991	(ED-A x IR-W-A / BW-A)
				ED-C	Exposure Duration, Child	6	years	EPA, 1991	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW-A	Body Weight , Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
Dermal	Resident	Child	Upper Aquifer-Tap Water	CW	Chemical Concentration in Water	See Table 3.1.RME		See Table 3.1.RME	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				Kp	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	

TABLE 4.1.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

SITE 5, ST. JULIENS CREEK ANNEX, CHESAPEAKE, VIRGINIA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal (continued)	Resident	Child	Upper Aquifer-Tap Water	B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific		EPA, 2004	Organics :
				t_{event}	Event Time	1.0	hr/event		t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	6,600	cm^2	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 xτ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2004	x CF1 x CF2
				EF	Exposure Frequency	350	days/year	EPA, 2004	
				ED	Exposure Duration	6	years	EPA, 2004	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	15	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF1 x CF2
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	
	Resident	Child/Adult	Upper Aquifer-Tap Water	CW	Chemical Concentration in Water	See Table 3.1.RME		See Table 3.1.RME	CDI (mg/kg-day) = DA-Adj x EF x 1/AT
				DAevent-A	Dermally Absorbed Dose per Event, Adult	calculated	mg/cm^2-event	calculated	
				DAevent-C	Dermally Absorbed Dose per Event, Child	calculated	mg/cm^2-event	calculated	DA-Adj = (Daevent-A x SA-A x ED-A x 1/BW-A)
				DA-Adj	Dermally Absorbed Dose, Age-adjusted	calculated	mg-year/event-kg	calculated	+ (Daevent-C x SA-C x ED-C x 1/BW-C)
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				Kp	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}-A	Event Time, Adult	0.58	hr/event	EPA, 2004	t_{event}<t*: DAevent (mg/cm^2-event) =
				t_{event}-C	Event Time, Child	1.0	hr/event	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 xτ x t_{event})/π))
				SA-A	Skin Surface Area, Adult	18,000	cm^2	EPA, 2004	x CF1 x CF2
				SA-C	Skin Surface Area, Child	6,600	cm^2	EPA, 2004	
				EV	Event Frequency	1	events/day	EPA, 2004	t_{event}>t*: DAevent (mg/cm^2-event) =
				EF	Exposure Frequency	350	days/year	EPA, 2004	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				ED-A	Exposure Duration, Adult	24	years	EPA, 2004	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF1 x CF2
				ED-C	Exposure Duration, Child	6	years	EPA, 2004	
				BW-A	Body Weight, Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	ke	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2004: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

TABLE 4.1.CT
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY
SITE 5, ST. JULIENS CREEK ANNEX, CHESAPEAKE, VIRGINIA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Child	Upper Aquifer-Tap Water	CW	Chemical Concentration in Water	See Table 3.1.CT		See Table 3.1.CT	CDI (mg/kg-day) =
				IR-W	Ingestion Rate of Water	1	liters/day	EPA, 1997	CW x IR-W x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	6	years	EPA, 1991	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
		Child/Adult	Upper Aquifer-Tap Water	CW	Chemical Concentration in Water	See Table 3.1.CT		See Table 3.1.CT	CDI (mg/kg-day) =
				IR-W-A	Ingestion Rate of Water, Adult	1.4	liters/day	EPA, 1993	CW x IR-W-Adj x EF x CF1 x 1/AT
				IR-W-C	Ingestion Rate of Water, Child	1	liters/day	EPA, 1997	
				IR-W-Adj	Ingestion Rate of Water, Age-adjusted	0.58	liter-year/kg-day	calculated	IR-W-Adj (liter-year/kd-day) =
				EF	Exposure Frequency	234	days/year	EPA, 1993	(ED-C x IR-W-C / BW-C) +
				ED-A	Exposure Duration, Adult	9	years	EPA, 1993	(ED-A x IR-W-A / BW-A)
				ED-C	Exposure Duration, Child	6	years	EPA, 1991	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW-A	Body Weight , Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
Dermal	Resident	Child	Upper Aquifer-Tap Water	CW	Chemical Concentration in Water	See Table 3.1.CT		See Table 3.1.CT	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				Kp	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}	Event Time	0.33	hr/event		t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	6,600	cm^2	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 xτ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2004	x CF1 x CF2
				EF	Exposure Frequency	234	days/year	EPA, 2004	
				ED	Exposure Duration	6	years	EPA, 2004	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	15	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF1 x CF2
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	

TABLE 4.1.CT

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY

SITE 5, ST. JULIENS CREEK ANNEX, CHESAPEAKE, VIRGINIA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal (continued)	Resident	Child/Adult	Upper Aquifer-Tap Water	CW	Chemical Concentration in Water	See Table 3.1.CT	µg/l	See Table 3.1.CT	CDI (mg/kg-day) = DA-Adj x EF x 1/AT
				DAevent-A	Dermally Absorbed Dose per Event, Adult	calculated	mg/cm^2-event	calculated	
				DAevent-C	Dermally Absorbed Dose per Event, Child	calculated	mg/cm^2-event	calculated	DA-Adj = (Daevent-A x SA-A x ED-A x 1/BW-A)
				DA-Adj	Dermally Absorbed Dose, Age-adjusted	calculated	mg-year/event-kg	calculated	+ (Daevent-C x SA-C x ED-C x 1/BW-C)
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				Kp	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}-A	Event Time, Adult	0.25	hr/event	EPA, 2004	t_{event}<t*: DAevent (mg/cm^2-event) =
				t_{event}-C	Event Time, Child	0.33	hr/event	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 xτ x t_{event})/π))
				SA-A	Skin Surface Area, Adult	18,000	cm^2	EPA, 2004	x CF1 x CF2
				SA-C	Skin Surface Area, Child	6,600	cm^2	EPA, 2004	
				EV	Event Frequency	1	events/day	EPA, 2004	t_{event}>t*: DAevent (mg/cm^2-event) =
				EF	Exposure Frequency	234	days/year	EPA, 1993	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				ED-A	Exposure Duration, Adult	9	years	EPA, 2001	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF1 x CF2
				ED-C	Exposure Duration, Child	6	years	EPA, 2001	
				BW-A	Body Weight, Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	ke	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2004: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

TABLE 5.1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

SITE 5, ST. JULIENS CREEK ANNEX, CHESAPEAKE, VIRGINIA

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (3) (MM/DD/YY)
Aluminum	Chronic	1.0E+00	mg/kg-day	NA	1.0E+00	mg/kg-day	CNS	100	PPRTV	01/15/05
Antimony	Chronic	4.0E-04	mg/kg-day	15%	6.0E-05	mg/kg-day	Longeviety, Blood Glocose and Cholesterol	1000/1	IRIS	01/15/05
Arsenic	Chronic	3.0E-04	mg/kg-day	95%	3.0E-04	mg/kg-day	Skin, Vascular	3/1	IRIS	01/15/05
Barium	Chronic	7.0E-02	mg/kg-day	7%	4.9E-03	mg/kg-day	Kidney	3/1	IRIS	01/15/05
Beryllium	Chronic	2.0E-03	mg/kg-day	1%	1.4E-05	mg/kg-day	Small Intestines	300/1	IRIS	01/15/05
Cadmium (water)	Chronic	5.0E-04	mg/kg-day	5.0%	2.5E-05	mg/kg-day	Kidney	10/1	IRIS	01/15/05
Chromium (hexavalent)	Chronic	3.0E-03	mg/kg-day	2.5%	7.5E-05	mg/kg-day	Gastrointestinal	300/3	IRIS	01/15/05
Cobalt	Chronic	2.0E-02	mg/kg-day	NA	2.0E-02	mg/kg-day	Blood	10/1	PPRTV	01/15/05
Iron	Chronic	3.0E-01	mg/kg-day	NA	3.0E-01	mg/kg-day	Gastrointestinal	1	NCEA	01/15/05
Lead	Chronic	N/A		NA	NA	mg/kg-day				01/15/05
Manganese (nonfood)	Chronic	2.0E-02	mg/kg-day	4%	8.0E-04	mg/kg-day	CNS	1/1	IRIS	01/15/05
Nickel	Chronic	2.0E-02	mg/kg-day	4%	8.0E-04	mg/kg-day	Decreased Body and Organ Weights	300	IRIS	01/15/05
Thallium	Chronic	7.0E-05	mg/kg-day	100%	7.0E-05	mg/kg-day	Skin, Vascular, Liver, Blood, Hair	3/1	RBC	01/15/05
Vanadium	Chronic	1.0E-03	mg/kg-day	2.6%	2.6E-05	mg/kg-day	Kidney	100	NCEA	01/15/05
Zinc	Chronic	3.0E-01	mg/kg-day	NA	3.0E-01	mg/kg-day	Blood	3/1	IRIS	01/15/05

N/A = Not Applicable or Not Available. IRIS indicates that calculations of dermal risks may not be appropriate for this chemical.

(1) Refer to RAGS, Part E. 2004.

ATSDR = Agency for Toxic Substances and Disease Registry

IRIS = Integrated Risk Information System

PPRTV = Provisional Peer-Reviewed Toxicity Values

NCEA = National Center for Environmental Assessment

HEAST= Health Effects Assessment Summary Tables

RBC = USEPA Region III Risk-Based Concentration Table

(2) Provide equation for derivation in text.

(3) For IRIS values, provide the date IRIS was searched.

For HEAST values, provide the date of HEAST.

For NCEA values, provide the date of the article provided by NCEA.

CNS = Central Nervous System

TABLE 6.1

CANCER TOXICITY DATA -- ORAL/DERMAL

SITE 5, ST. JULIENS CREEK ANNEX, CHESAPEAKE, VIRGINIA

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor	Adjusted Dermal Cancer Slope Factor (1)	Units	EPA Carcinogen Group	Source	Date (2) (MM/DD/YY)
Aluminum	NA						
Antimony	NA						
Arsenic	1.5E+00	95%	1.5E+00	$(mg/kg\text{-}day)^{-1}$	A	IRIS	1/15/2004
Barium	NA						
Beryllium	NA						
Cadmium-Water	NA						
Chromium (hexavalent)	NA						
Cobalt	NA						
Iron	NA						
Lead	NA						
Manganese (nonfood)	NA						
Nickel	NA						
Thallium	NA						
Vanadium	NA						
Zinc	NA						

NA - Not Available

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

NCEA = National Center for Environmental Assessment

U = Under review.

EPA Carcinogen Group:

A - Human carcinogen

B1 - Probable human carcinogen - indicates that limited human data are available

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

C - Possible human carcinogen

D - Not classifiable as a human carcinogen

E - Evidence of noncarcinogenicity

(1) Refer to RAGS, Part E, 2004.

(2) For IRIS values, provide the date IRIS was searched.
For HEAST values, provide the date of HEAST.
For NCEA values, provide article date provided by NCEA.
For RBC values, provide the date of last change in the Tables.

TABLE 7.1.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

SITE 5, ST. JULIENS CREEK ANNEX, CHESAPEAKE, VIRGINIA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Shallow Aquifer - Tap Water	Ingestion	Aluminum	4.9E+04	ug/L	NA	NA	N/A	NA	NA	3.1E+00	mg/kg/day	1.0E+00	mg/kg/day	3.1E+00
				Antimony	3.1E+00	ug/L	NA	NA	N/A	NA	NA	2.0E-04	mg/kg/day	4.0E-04	mg/kg/day	5.0E-01
				Arsenic	1.1E+01	ug/L	NA	NA	N/A	NA	NA	6.8E-04	mg/kg/day	3.0E-04	mg/kg/day	2.3E+00
				Barium	1.8E+02	ug/L	NA	NA	N/A	NA	NA	1.2E-02	mg/kg/day	7.0E-02	mg/kg/day	1.7E-01
				Beryllium	1.3E+01	ug/L	NA	NA	N/A	NA	NA	8.4E-04	mg/kg/day	2.0E-03	mg/kg/day	4.2E-01
				Cadmium	1.1E+01	ug/L	NA	NA	N/A	NA	NA	7.0E-04	mg/kg/day	5.0E-04	mg/kg/day	1.4E+00
				Chromium (total)	1.8E+01	ug/L	NA	NA	N/A	NA	NA	1.2E-03	mg/kg/day	3.0E-03	mg/kg/day	3.9E-01
				Cobalt	1.4E+02	ug/L	NA	NA	N/A	NA	NA	8.6E-03	mg/kg/day	2.0E-02	mg/kg/day	4.3E-01
				Iron	5.4E+04	ug/L	NA	NA	N/A	NA	NA	3.4E+00	mg/kg/day	3.0E-01	mg/kg/day	1.1E+01
				Manganese	4.3E+03	ug/L	NA	NA	N/A	NA	NA	2.8E-01	mg/kg/day	2.0E-02	mg/kg/day	1.4E+01
				Nickel	2.5E+02	ug/L	NA	NA	N/A	NA	NA	1.6E-02	mg/kg/day	2.0E-02	mg/kg/day	7.8E-01
				Thallium	2.1E+00	ug/L	NA	NA	N/A	NA	NA	1.3E-04	mg/kg/day	7.0E-05	mg/kg/day	1.9E+00
				Vanadium	2.8E+01	ug/L	NA	NA	N/A	NA	NA	1.8E-03	mg/kg/day	1.0E-03	mg/kg/day	1.8E+00
				Zinc	2.0E+03	ug/L	NA	NA	N/A	NA	NA	1.3E-01	mg/kg/day	3.0E-01	mg/kg/day	4.3E-01
			Exp. Route Total								NA					3.9E+01
			Dermal Absorption	Aluminum	4.9E+04	ug/L	NA	NA	N/A	NA	NA	2.1E-02	mg/kg/day	1.0E+00	mg/kg/day	2.1E-02
				Antimony	3.1E+00	ug/L	NA	NA	N/A	NA	NA	1.3E-06	mg/kg/day	6.0E-05	mg/kg/day	2.2E-02
				Arsenic	1.1E+01	ug/L	NA	NA	N/A	NA	NA	4.5E-06	mg/kg/day	3.0E-04	mg/kg/day	1.5E-02
				Barium	1.8E+02	ug/L	NA	NA	N/A	NA	NA	7.7E-05	mg/kg/day	4.9E-03	mg/kg/day	1.6E-02
				Beryllium	1.3E+01	ug/L	NA	NA	N/A	NA	NA	5.6E-06	mg/kg/day	1.4E-05	mg/kg/day	4.0E-01
				Cadmium	1.1E+01	ug/L	NA	NA	N/A	NA	NA	4.6E-06	mg/kg/day	2.5E-05	mg/kg/day	1.9E-01
				Chromium (total)	1.8E+01	ug/L	NA	NA	N/A	NA	NA	1.6E-05	mg/kg/day	7.5E-05	mg/kg/day	2.1E-01
				Cobalt	1.4E+02	ug/L	NA	NA	N/A	NA	NA	5.7E-05	mg/kg/day	2.0E-02	mg/kg/day	2.9E-03
				Iron	5.4E+04	ug/L	NA	NA	N/A	NA	NA	2.3E-02	mg/kg/day	3.0E-01	mg/kg/day	7.6E-02
				Manganese	4.3E+03	ug/L	NA	NA	N/A	NA	NA	1.8E-03	mg/kg/day	8.0E-04	mg/kg/day	2.3E+00
				Nickel	2.5E+02	ug/L	NA	NA	N/A	NA	NA	2.1E-05	mg/kg/day	8.0E-04	mg/kg/day	2.6E-02
				Thallium	2.1E+00	ug/L	NA	NA	N/A	NA	NA	8.9E-07	mg/kg/day	7.0E-05	mg/kg/day	1.3E-02
				Vanadium	2.8E+01	ug/L	NA	NA	N/A	NA	NA	1.2E-05	mg/kg/day	2.6E-05	mg/kg/day	4.5E-01
				Zinc	2.0E+03	ug/L	NA	NA	N/A	NA	NA	5.1E-04	mg/kg/day	3.0E-01	mg/kg/day	1.7E-03
			Exp. Route Total								NA					3.7E+00
		Exposure Point Total									NA					4.3E+01
	Exposure Medium Total										NA					4.3E+01
Medium Total											NA					4.3E+01
									Total of Receptor Risks Across All Media		NA			Total of Receptor Hazards Across All Media		4.3E+01

Table 7.1.RME Supplement A
Calculation of DAevent
Resident Child Ground Water
SITE 5, ST. JULIENS CREEK ANNEX, CHESAPEAKE, VIRGINIA

Chemical of Potential Concern	Water Concentration (CW) (µg/L)	Permeability Coefficient (Kp) (cm/hr)	B (dimensionless)	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm^2-event)	Eq
Aluminum	4.9E+04	1.0E-03	NA	NA	NA	NA	1	4.9E-05	1
Antimony	3.1E+00	1.0E-03	NA	NA	NA	NA	1	3.1E-09	1
Arsenic	1.1E+01	1.0E-03	NA	NA	NA	NA	1	1.1E-08	1
Barium	1.8E+02	1.0E-03	NA	NA	NA	NA	1	1.8E-07	1
Beryllium	1.3E+01	1.0E-03	NA	NA	NA	NA	1	1.3E-08	1
Cadmium	1.1E+01	1.0E-03	NA	NA	NA	NA	1	1.1E-08	1
Chromium (total)	1.8E+01	2.0E-03	NA	NA	NA	NA	1	3.7E-08	1
Cobalt	1.4E+02	1.0E-03	NA	NA	NA	NA	1	1.4E-07	1
Iron	5.4E+04	1.0E-03	NA	NA	NA	NA	1	5.4E-05	1
Manganese	4.3E+03	1.0E-03	NA	NA	NA	NA	1	4.3E-06	1
Nickel	2.5E+02	2.0E-04	NA	NA	NA	NA	1	4.9E-08	1
Thallium	2.1E+00	1.0E-03	NA	NA	NA	NA	1	2.1E-09	1
Vanadium	2.8E+01	1.0E-03	NA	NA	NA	NA	1	2.8E-08	1
Zinc	2.0E+03	6.0E-04	NA	NA	NA	NA	1	1.2E-06	1

Inorganics: DAevent (mg/cm2-event) =
Kp x CW x tevent x 0.001 mg/ug x 0.001 l/cm^3 (eq 1)

Organics: DAevent (mg/cm2-event) =

$$\text{If } t_{event} \le t^*, \text{then } DA_{event} = 2 \times FA \times K_p \times C_w \times 0.001\ mg/ug \times 0.001\ l/cm^3 \sqrt{\frac{6 \times \tau_{event} \times t_{event}}{\pi}} \quad \text{(eq 2)}$$

$$\text{If } t_{event} \ge t^*, \text{then } DA_{event} = FA \times K_p \times C_w \times 0.001\ mg/ug \times 0.001\ l/cm^3 \left[\frac{t_{event}}{1+B} + 2 \times \tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right] \quad \text{(eq 3)}$$

Notes:
Permeability constants from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document.
NA - not applicable.

Table 7.1.RME Supplement B
Calculation of DAevent
Resident Adult Ground Water
SITE 5, ST. JULIENS CREEK ANNEX, CHESAPEAKE, VIRGINIA

Chemical of Potential Concern	Water Concentration (CW) (µg/L)	Permeability Coefficient (Kp) (cm/hr)	B (dimensionless)	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm^2-event)	Eq
Aluminum	4.9E+04	1.0E-03	NA	NA	NA	NA	0.58	2.8E-05	1
Antimony	3.1E+00	1.0E-03	NA	NA	NA	NA	0.58	1.8E-09	1
Arsenic	1.1E+01	1.0E-03	NA	NA	NA	NA	0.58	6.1E-09	1
Barium	1.8E+02	1.0E-03	NA	NA	NA	NA	0.58	1.1E-07	1
Beryllium	1.3E+01	1.0E-03	NA	NA	NA	NA	0.58	7.7E-09	1
Cadmium	1.1E+01	1.0E-03	NA	NA	NA	NA	0.58	6.4E-09	1
Chromium (total)	1.8E+01	2.0E-03	NA	NA	NA	NA	0.58	2.1E-08	1
Cobalt	1.4E+02	1.0E-03	NA	NA	NA	NA	0.58	7.8E-08	1
Iron	5.4E+04	1.0E-03	NA	NA	NA	NA	0.58	3.1E-05	1
Manganese	4.3E+03	1.0E-03	NA	NA	NA	NA	0.58	2.5E-06	1
Nickel	2.5E+02	2.0E-04	NA	NA	NA	NA	0.58	2.8E-08	1
Thallium	2.1E+00	1.0E-03	NA	NA	NA	NA	0.58	1.2E-09	1
Vanadium	2.8E+01	1.0E-03	NA	NA	NA	NA	0.58	1.6E-08	1
Zinc	2.0E+03	6.0E-04	NA	NA	NA	NA	0.58	7.0E-07	1

Inorganics: DAevent (mg/cm2-event) =
Kp x CW x tevent x 0.001 mg/ug x 0.001 l/cm^3 (eq 1)

Organics: DAevent (mg/cm2-event) =

$$\text{If } t_{event} \le t^*, \text{then } DA_{event} = 2 \times FA \times K_p \times C_w \times 0.001 \ mg/ug \times 0.001 \ l/cm^3 \sqrt{\frac{6 \times \tau_{event} \times t_{event}}{\pi}} \quad \text{(eq 2)}$$

$$\text{If } t_{event} \ge t^*, \text{then } DA_{event} = FA \times K_p \times C_w \times 0.001 \ mg/ug \times 0.001 \ l/cm^3 \left[\frac{t_{event}}{1+B} + 2 \times \tau_{event} \left(\frac{1+3B+3B^2}{(1+B)^2} \right) \right] \quad \text{(eq 3)}$$

Notes:
Permeability constants from EPA 2001, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Interim).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document.
NA - not applicable.
**Values for heptachlor used as surrogates

TABLE 7.1.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

SITE 5, ST. JULIENS CREEK ANNEX, CHESAPEAKE, VIRGINIA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Shallow Aquifer - Tap Water	Ingestion	Aluminum	1.6E+04	ug/L	NA	NA	N/A	NA	NA	6.8E-01	mg/kg/day	1.0E+00	mg/kg/day	6.8E-01
				Antimony	1.5E+00	ug/L	NA	NA	N/A	NA	NA	6.3E-05	mg/kg/day	4.0E-04	mg/kg/day	1.6E-01
				Arsenic	6.8E+00	ug/L	NA	NA	N/A	NA	NA	2.9E-04	mg/kg/day	3.0E-04	mg/kg/day	9.6E-01
				Barium	8.4E+01	ug/L	NA	NA	N/A	NA	NA	3.6E-03	mg/kg/day	7.0E-02	mg/kg/day	5.1E-02
				Beryllium	4.8E+00	ug/L	NA	NA	N/A	NA	NA	2.1E-04	mg/kg/day	2.0E-03	mg/kg/day	1.0E-01
				Cadmium	2.7E+00	ug/L	NA	NA	N/A	NA	NA	1.2E-04	mg/kg/day	5.0E-04	mg/kg/day	2.3E-01
				Chromium (total)	8.3E+00	ug/L	NA	NA	N/A	NA	NA	3.5E-04	mg/kg/day	3.0E-03	mg/kg/day	1.2E-01
				Cobalt	5.8E+01	ug/L	NA	NA	N/A	NA	NA	2.5E-03	mg/kg/day	2.0E-02	mg/kg/day	1.2E-01
				Iron	4.2E+04	ug/L	NA	NA	N/A	NA	NA	1.8E+00	mg/kg/day	3.0E-01	mg/kg/day	5.9E+00
				Manganese	2.7E+03	ug/L	NA	NA	N/A	NA	NA	1.2E-01	mg/kg/day	2.0E-02	mg/kg/day	5.9E+00
				Nickel	9.0E+01	ug/L	NA	NA	N/A	NA	NA	3.8E-03	mg/kg/day	2.0E-02	mg/kg/day	1.9E-01
				Thallium	1.5E+00	ug/L	NA	NA	N/A	NA	NA	6.5E-05	mg/kg/day	7.0E-05	mg/kg/day	9.2E-01
				Vanadium	9.4E+00	ug/L	NA	NA	N/A	NA	NA	4.0E-04	mg/kg/day	1.0E-03	mg/kg/day	4.0E-01
				Zinc	5.7E+02	ug/L	NA	NA	N/A	NA	NA	2.4E-02	mg/kg/day	3.0E-01	mg/kg/day	8.1E-02
			Exp. Route Total								NA					1.6E+01
			Dermal Absorption	Aluminum	1.6E+04	ug/L	NA	NA	N/A	NA	NA	1.5E-03	mg/kg/day	1.0E+00	mg/kg/day	1.5E-03
				Antimony	1.5E+00	ug/L	NA	NA	N/A	NA	NA	1.4E-07	mg/kg/day	6.0E-05	mg/kg/day	2.3E-03
				Arsenic	6.8E+00	ug/L	NA	NA	N/A	NA	NA	6.3E-07	mg/kg/day	3.0E-04	mg/kg/day	2.1E-03
				Barium	8.4E+01	ug/L	NA	NA	N/A	NA	NA	7.8E-06	mg/kg/day	4.9E-03	mg/kg/day	1.6E-03
				Beryllium	4.8E+00	ug/L	NA	NA	N/A	NA	NA	4.5E-07	mg/kg/day	1.4E-05	mg/kg/day	3.2E-02
				Cadmium	2.7E+00	ug/L	NA	NA	N/A	NA	NA	2.5E-07	mg/kg/day	2.5E-05	mg/kg/day	1.0E-02
				Chromium (total)	8.3E+00	ug/L	NA	NA	N/A	NA	NA	1.5E-06	mg/kg/day	7.5E-05	mg/kg/day	2.1E-02
				Cobalt	5.8E+01	ug/L	NA	NA	N/A	NA	NA	5.4E-06	mg/kg/day	2.0E-02	mg/kg/day	2.7E-04
				Iron	4.2E+04	ug/L	NA	NA	N/A	NA	NA	3.9E-03	mg/kg/day	3.0E-01	mg/kg/day	1.3E-02
				Manganese	2.7E+03	ug/L	NA	NA	N/A	NA	NA	2.6E-04	mg/kg/day	8.0E-04	mg/kg/day	3.2E-01
				Nickel	9.0E+01	ug/L	NA	NA	N/A	NA	NA	1.7E-06	mg/kg/day	8.0E-04	mg/kg/day	2.1E-03
				Thallium	1.5E+00	ug/L	NA	NA	N/A	NA	NA	1.4E-07	mg/kg/day	7.0E-05	mg/kg/day	2.0E-03
				Vanadium	9.4E+00	ug/L	NA	NA	N/A	NA	NA	8.7E-07	mg/kg/day	2.6E-05	mg/kg/day	3.4E-02
				Zinc	5.7E+02	ug/L	NA	NA	N/A	NA	NA	3.2E-05	mg/kg/day	3.0E-01	mg/kg/day	1.1E-04
			Exp. Route Total								NA					4.4E-01
		Exposure Point Total									NA					1.6E+01
	Exposure Medium Total										NA					1.6E+01
Medium Total											NA					1.6E+01
									Total of Receptor Risks Across All Media		NA			Total of Receptor Hazards Across All Media		1.6E+01

Table 7.1.CTE Supplement A
Calculation of DAevent
Resident Child Ground Water
SITE 5, ST. JULIENS CREEK ANNEX, CHESAPEAKE, VIRGINIA

Chemical of Potential Concern	Water Concentration (CW) (µg/L)	Permeability Coefficient (Kp) (cm/hr)	B (dimensionless)	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm^2-event)	Eq
Aluminum	1.6E+04	1.0E-03	NA	NA	NA	NA	0.33	5.3E-06	1
Antimony	1.5E+00	1.0E-03	NA	NA	NA	NA	0.33	4.9E-10	1
Arsenic	6.8E+00	1.0E-03	NA	NA	NA	NA	0.33	2.2E-09	1
Barium	8.4E+01	1.0E-03	NA	NA	NA	NA	0.33	2.8E-08	1
Beryllium	4.8E+00	1.0E-03	NA	NA	NA	NA	0.33	1.6E-09	1
Cadmium	2.7E+00	1.0E-03	NA	NA	NA	NA	0.33	9.0E-10	1
Chromium (total)	8.3E+00	2.0E-03	NA	NA	NA	NA	0.33	5.5E-09	1
Cobalt	5.8E+01	1.0E-03	NA	NA	NA	NA	0.33	1.9E-08	1
Iron	4.2E+04	1.0E-03	NA	NA	NA	NA	0.33	1.4E-05	1
Manganese	2.7E+03	1.0E-03	NA	NA	NA	NA	0.33	9.1E-07	1
Nickel	9.0E+01	2.0E-04	NA	NA	NA	NA	0.33	5.9E-09	1
Thallium	1.5E+00	1.0E-03	NA	NA	NA	NA	0.33	5.0E-10	1
Vanadium	9.4E+00	1.0E-03	NA	NA	NA	NA	0.33	3.1E-09	1
Zinc	5.7E+02	6.0E-04	NA	NA	NA	NA	0.33	1.1E-07	1

Inorganics: DAevent (mg/cm2-event) =
Kp x CW x tevent x 0.001 mg/ug x 0.001 l/cm^3 (eq 1)

Organics: DAevent (mg/cm2-event) =

$$\text{If } t_{event} \le t^*, \text{then } DA_{event} = 2 \times FA \times K_p \times C_w \times 0.001\ mg/ug \times 0.001\ l/cm^3 \sqrt{\frac{6 \times \tau_{event} \times t_{event}}{\pi}} \quad \text{(eq 2)}$$

$$\text{If } t_{event} \ge t^*, \text{then } DA_{event} = FA \times K_p \times C_w \times 0.001\ mg/ug \times 0.001\ l/cm^3 \left[\frac{t_{event}}{1+B} + 2 \times \tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right] \quad \text{(eq 3)}$$

Notes:
Permeability constants from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document.
NA - not applicable.

Table 7.1.CTE Supplement B
Calculation of DAevent
Resident Adult Ground Water
SITE 5, ST. JULIENS CREEK ANNEX, CHESAPEAKE, VIRGINIA

Chemical of Potential Concern	Water Concentration (CW) (µg/L)	Permeability Coefficient (Kp) (cm/hr)	B (dimensionless)	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm^2-event)	Eq
Aluminum	1.6E+04	1.0E-03	NA	NA	NA	NA	0.25	4.0E-06	1
Antimony	1.5E+00	1.0E-03	NA	NA	NA	NA	0.25	3.7E-10	1
Arsenic	6.8E+00	1.0E-03	NA	NA	NA	NA	0.25	1.7E-09	1
Barium	8.4E+01	1.0E-03	NA	NA	NA	NA	0.25	2.1E-08	1
Beryllium	4.8E+00	1.0E-03	NA	NA	NA	NA	0.25	1.2E-09	1
Cadmium	2.7E+00	1.0E-03	NA	NA	NA	NA	0.25	6.8E-10	1
Chromium (total)	8.3E+00	2.0E-03	NA	NA	NA	NA	0.25	4.1E-09	1
Cobalt	5.8E+01	1.0E-03	NA	NA	NA	NA	0.25	1.4E-08	1
Iron	4.2E+04	1.0E-03	NA	NA	NA	NA	0.25	1.0E-05	1
Manganese	2.7E+03	1.0E-03	NA	NA	NA	NA	0.25	6.9E-07	1
Nickel	9.0E+01	2.0E-04	NA	NA	NA	NA	0.25	4.5E-09	1
Thallium	1.5E+00	1.0E-03	NA	NA	NA	NA	0.25	3.8E-10	1
Vanadium	9.4E+00	1.0E-03	NA	NA	NA	NA	0.25	2.3E-09	1
Zinc	5.7E+02	6.0E-04	NA	NA	NA	NA	0.25	8.5E-08	1

Inorganics: DAevent (mg/cm2-event) =
Kp x CW x tevent x 0.001 mg/ug x 0.001 l/cm^3 (eq 1)

Organics: DAevent (mg/cm2-event) =

$$\text{If } t_{event} \le t^*, \text{then } DA_{event} = 2 \times FA \times K_p \times C_w \times 0.001 \ mg/ug \times 0.001 \ l/cm^3 \sqrt{\frac{6 \times \tau_{event} \times t_{event}}{\pi}} \quad \text{(eq 2)}$$

$$\text{If } t_{event} \ge t^*, \text{then } DA_{event} = FA \times K_p \times C_w \times 0.001 \ mg/ug \times 0.001 \ l/cm^3 \left[\frac{t_{event}}{1+B} + 2 \times \tau_{event} \left(\frac{1+3B+3B^2}{(1+B)^2} \right) \right] \quad \text{(eq 3)}$$

Notes:
Permeability constants from EPA 2001, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Interim).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document.
NA - not applicable.
**Values for heptachlor used as surrogates

TABLE 7.2.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SITE 5, ST. JULIENS CREEK ANNEX, CHESAPEAKE, VIRGINIA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult/Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
							Intake/Exposure Concentration		CSF/Unit Risk			Intake/Exposure Concentration		RfD/RfC		
					Value	Units	Value	Units	Value	Units	Cancer Risk	Value	Units	Value	Units	Hazard Quotient
Groundwater	Groundwater	Shallow Aquifer - Tap Water	Ingestion	Aluminum	4.9E+04	ug/L	7.3E-01	mg/kg/day	N/A	NA	NA	NA	NA	NA	NA	NA
				Antimony	3.1E+00	ug/L	4.7E-05	mg/kg/day	NA	NA	NA	NA	NA	NA	NA	NA
				Arsenic	1.1E+01	ug/L	1.6E-04	mg/kg/day	1.5E+00	1/(mg/kg-day)	2.4E-04	NA	NA	NA	NA	NA
				Barium	1.8E+02	ug/L	2.7E-03	mg/kg/day	NA	NA	NA	NA	NA	NA	NA	NA
				Beryllium	1.3E+01	ug/L	2.0E-04	mg/kg/day	NA	NA	NA	NA	NA	NA	NA	NA
				Cadmium	1.1E+01	ug/L	1.6E-04	mg/kg/day	NA	NA	NA	NA	NA	NA	NA	NA
				Chromium (total)	1.8E+01	ug/L	2.7E-04	mg/kg/day	N/A	NA	NA	NA	NA	NA	NA	NA
				Cobalt	1.4E+02	ug/L	2.0E-03	mg/kg/day	N/A	NA	NA	NA	NA	NA	NA	NA
				Iron	5.4E+04	ug/L	8.0E-01	mg/kg/day	N/A	NA	NA	NA	NA	NA	NA	NA
				Manganese	4.3E+03	ug/L	6.4E-02	mg/kg/day	N/A	NA	NA	NA	NA	NA	NA	NA
				Nickel	2.5E+02	ug/L	3.6E-03	mg/kg/day	N/A	NA	NA	NA	NA	NA	NA	NA
				Thallium	2.1E+00	ug/L	3.1E-05	mg/kg/day	N/A	NA	NA	NA	NA	NA	NA	NA
				Vanadium	2.8E+01	ug/L	4.1E-04	mg/kg/day	N/A	NA	NA	NA	NA	NA	NA	NA
				Zinc	2.0E+03	ug/L	3.0E-02	mg/kg/day	N/A	NA	NA	NA	NA	NA	NA	NA
			Exp. Route Total								2.4E-04					0.0E+00
			Dermal Absorption	Aluminum	4.9E+04	ug/L	3.1E-04	mg/kg/day	N/A	NA	NA	NA	NA	NA	NA	NA
				Antimony	3.1E+00	ug/L	1.3E-12	mg/kg/day	NA	NA	NA	NA	NA	NA	NA	NA
				Arsenic	1.1E+01	ug/L	1.5E-11	mg/kg/day	1.5E+00	1/(mg/kg-day)	2.2E-11	NA	NA	NA	NA	NA
				Barium	1.8E+02	ug/L	4.4E-09	mg/kg/day	NA	NA	NA	NA	NA	NA	NA	NA
				Beryllium	1.3E+01	ug/L	2.3E-11	mg/kg/day	NA	NA	NA	NA	NA	NA	NA	NA
				Cadmium	1.1E+01	ug/L	1.6E-11	mg/kg/day	NA	NA	NA	NA	NA	NA	NA	NA
				Chromium (total)	1.8E+01	ug/L	1.7E-10	mg/kg/day	N/A	NA	NA	NA	NA	NA	NA	NA
				Cobalt	1.4E+02	ug/L	2.4E-09	mg/kg/day	N/A	NA	NA	NA	NA	NA	NA	NA
				Iron	5.4E+04	ug/L	3.8E-04	mg/kg/day	N/A	NA	NA	NA	NA	NA	NA	NA
				Manganese	4.3E+03	ug/L	2.4E-06	mg/kg/day	N/A	NA	NA	NA	NA	NA	NA	NA
				Nickel	2.5E+02	ug/L	3.1E-10	mg/kg/day	N/A	NA	NA	NA	NA	NA	NA	NA
				Thallium	2.1E+00	ug/L	5.7E-13	mg/kg/day	N/A	NA	NA	NA	NA	NA	NA	NA
				Vanadium	2.8E+01	ug/L	9.9E-11	mg/kg/day	N/A	NA	NA	NA	NA	NA	NA	NA
				Zinc	2.0E+03	ug/L	1.9E-07	mg/kg/day	N/A	NA	NA	NA	NA	NA	NA	NA
			Exp. Route Total								2.2E-11					0.0E+00
		Exposure Point Total									2.4E-04					0.0E+00
	Exposure Medium Total										2.4E-04					0.0E+00
Medium Total											2.4E-04					0.0E+00
										Total of Receptor Risks Across All Media	2.4E-04			Total of Receptor Hazards Across All Media		0.0E+00

TABLE 7.2.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
SITE 5, ST. JULIENS CREEK ANNEX, CHESAPEAKE, VIRGINIA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult/Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
							Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Shallow Aquifer - Tap Water	Ingestion	Aluminum	1.6E+04	ug/L	8.5E-02	mg/kg/day	N/A	NA	NA	NA	NA	NA	NA	NA
				Antimony	1.5E+00	ug/L	7.9E-06	mg/kg/day	NA	NA	NA	NA	NA	NA	NA	NA
				Arsenic	6.8E+00	ug/L	3.6E-05	mg/kg/day	1.5E+00	1/(mg/kg-day)	5.4E-05	NA	NA	NA	NA	NA
				Barium	8.4E+01	ug/L	4.5E-04	mg/kg/day	NA	NA	NA	NA	NA	NA	NA	NA
				Beryllium	4.8E+00	ug/L	2.6E-05	mg/kg/day	NA	NA	NA	NA	NA	NA	NA	NA
				Cadmium	2.7E+00	ug/L	1.5E-05	mg/kg/day	NA	NA	NA	NA	NA	NA	NA	NA
				Chromium (total)	8.3E+00	ug/L	4.4E-05	mg/kg/day	N/A	NA	NA	NA	NA	NA	NA	NA
				Cobalt	5.8E+01	ug/L	3.1E-04	mg/kg/day	N/A	NA	NA	NA	NA	NA	NA	NA
				Iron	4.2E+04	ug/L	2.2E-01	mg/kg/day	N/A	NA	NA	NA	NA	NA	NA	NA
				Manganese	2.7E+03	ug/L	1.5E-02	mg/kg/day	N/A	NA	NA	NA	NA	NA	NA	NA
				Nickel	9.0E+01	ug/L	4.8E-04	mg/kg/day	N/A	NA	NA	NA	NA	NA	NA	NA
				Thallium	1.5E+00	ug/L	8.0E-06	mg/kg/day	N/A	NA	NA	NA	NA	NA	NA	NA
				Vanadium	9.4E+00	ug/L	5.0E-05	mg/kg/day	N/A	NA	NA	NA	NA	NA	NA	NA
				Zinc	5.7E+02	ug/L	3.0E-03	mg/kg/day	N/A	NA	NA	NA	NA	NA	NA	NA
			Exp. Route Total								5.4E-05					0.0E+00
			Dermal Absorption	Aluminum	1.6E+04	ug/L	2.1E-04	mg/kg/day	N/A	NA	NA	NA	NA	NA	NA	NA
				Antimony	1.5E+00	ug/L	2.0E-08	mg/kg/day	NA	NA	NA	NA	NA	NA	NA	NA
				Arsenic	6.8E+00	ug/L	9.0E-08	mg/kg/day	1.5E+00	1/(mg/kg-day)	1.3E-07	NA	NA	NA	NA	NA
				Barium	8.4E+01	ug/L	1.1E-06	mg/kg/day	NA	NA	NA	NA	NA	NA	NA	NA
				Beryllium	4.8E+00	ug/L	6.4E-08	mg/kg/day	NA	NA	NA	NA	NA	NA	NA	NA
				Cadmium	2.7E+00	ug/L	3.6E-08	mg/kg/day	NA	NA	NA	NA	NA	NA	NA	NA
				Chromium (total)	8.3E+00	ug/L	2.2E-07	mg/kg/day	N/A	NA	NA	NA	NA	NA	NA	NA
				Cobalt	5.8E+01	ug/L	7.7E-07	mg/kg/day	N/A	NA	NA	NA	NA	NA	NA	NA
				Iron	4.2E+04	ug/L	5.5E-04	mg/kg/day	N/A	NA	NA	NA	NA	NA	NA	NA
				Manganese	2.7E+03	ug/L	3.6E-05	mg/kg/day	N/A	NA	NA	NA	NA	NA	NA	NA
				Nickel	9.0E+01	ug/L	2.4E-07	mg/kg/day	N/A	NA	NA	NA	NA	NA	NA	NA
				Thallium	1.5E+00	ug/L	2.0E-08	mg/kg/day	N/A	NA	NA	NA	NA	NA	NA	NA
				Vanadium	9.4E+00	ug/L	1.2E-07	mg/kg/day	N/A	NA	NA	NA	NA	NA	NA	NA
				Zinc	5.7E+02	ug/L	4.5E-06	mg/kg/day	N/A	NA	NA	NA	NA	NA	NA	NA
			Exp. Route Total								1.3E-07					0.0E+00
		Exposure Point Total									5.4E-05					0.0E+00
	Exposure Medium Total										5.4E-05					0.0E+00
Medium Total											5.4E-05					0.0E+00
											Total of Receptor Risks Across All Media	5.4E-05		Total of Receptor Hazards Across All Media		0.0E+00

TABLE 9.1.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

SITE 5, ST. JULIENS CREEK ANNEX, CHESAPEAKE, VIRGINIA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer - Tap Water	Aluminum	NA	NA	NA	0.0E+00	CNS	3.1E+00	NA	2.1E-02	3.1E+00
			Antimony	NA	NA	NA	0.0E+00	Longeviety, Blood Glocose and Cholesterol	5.0E-01	NA	2.2E-02	5.2E-01
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	2.3E+00	NA	1.5E-02	2.3E+00
			Barium	NA	NA	NA	0.0E+00	Kidney	1.7E-01	NA	1.6E-02	1.8E-01
			Beryllium	NA	NA	NA	0.0E+00	Small Intestines	4.2E-01	NA	4.0E-01	8.2E-01
			Cadmium	NA	NA	NA	0.0E+00	Kidney	1.4E+00	NA	1.9E-01	1.6E+00
			Chromium (total)	NA	NA	NA	0.0E+00	NA	3.9E-01	NA	2.1E-01	6.0E-01
			Cobalt	NA	NA	NA	0.0E+00	Blood	4.3E-01	NA	2.9E-03	4.4E-01
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	1.1E+01	NA	7.6E-02	1.2E+01
			Manganese	NA	NA	NA	0.0E+00	CNS	1.4E+01	NA	2.3E+00	1.6E+01
			Nickel	NA	NA	NA	0.0E+00	Decreased Body and Organ Weights	7.8E-01	NA	1.3E-01	9.1E-01
			Thallium	NA	NA	NA	0.0E+00	Skin, Vascular, Liver, Blood, Hair	1.9E+00	NA	2.5E-03	1.9E+00
			Vanadium	NA	NA	NA	0.0E+00	Kidney	1.8E+00	NA	4.5E-01	2.2E+00
			Zinc	NA	NA	NA	0.0E+00	Blood	4.3E-01	NA	1.7E-03	4.3E-01
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		3.9E+01	0.0E+00	3.8E+00	4.3E+01
		Exposure Point Total					0.0E+00					4.3E+01
	Exposure Medium Total						0.0E+00					4.3E+01
Medium Total							0.0E+00					4.3E+01
Receptor Total							0.0E+00				Receptor HI Total	4.3E+01

HI - Hazard Index

CNS - Central Nervous System

NA - Not Applicable

Total CNS HI Across All Media =	1.9E+01
Total Longeviety HI Across All Media =	5.2E-01
Total Blood Glucose and Cholesterol HI Across All Media =	5.2E-01
Total Skin HI Across All Media=	4.2E+00
Total Vascular HI Across All Media =	4.2E+00
Total Kidney HI Across All Media =	4.0E+00
Total Small Instestine HI Across All Media =	8.2E-01
Total Gastrointestinal HI Across All Media =	1.2E+01
Total Liver HI Across All Media =	1.9E+00
Total Blood HI Across All Media =	2.8E+00
Total Hair HI Across All Media =	1.9E+00
Total Body Weight HI Across All Media =	9.1E-01

TABLE 9.1.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
SITE 5, ST. JULIENS CREEK ANNEX, CHESAPEAKE, VIRGINIA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer - Tap Water	Aluminum	NA	NA	NA	0.0E+00	CNS	6.8E-01	NA	1.5E-03	6.9E-01
			Antimony	NA	NA	NA	0.0E+00	Longeviety, Blood Glocose and Cholesterol	1.6E-01	NA	2.3E-03	1.6E-01
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	9.6E-01	NA	2.1E-03	9.7E-01
			Barium	NA	NA	NA	0.0E+00	Kidney	5.1E-02	NA	1.6E-03	5.3E-02
			Beryllium	NA	NA	NA	0.0E+00	Small Intestines	1.0E-01	NA	3.2E-02	1.3E-01
			Cadmium	NA	NA	NA	0.0E+00	Kidney	2.3E-01	NA	1.0E-02	2.4E-01
			Chromium (total)	NA	NA	NA	0.0E+00	Gastrointestinal	1.2E-01	NA	2.1E-02	1.4E-01
			Cobalt	NA	NA	NA	0.0E+00	Blood	1.2E-01	NA	2.7E-04	1.2E-01
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	5.9E+00	NA	1.3E-02	5.9E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	5.9E+00	NA	3.2E-01	6.2E+00
			Nickel	NA	NA	NA	0.0E+00	Decreased Body and Organ Weights	1.9E-01	NA	1.0E-02	2.0E-01
			Thallium	NA	NA	NA	0.0E+00	Skin, Vascular, Liver, Blood, Hair	9.2E-01	NA	4.0E-04	9.2E-01
			Vanadium	NA	NA	NA	0.0E+00	Kidney	4.0E-01	NA	3.4E-02	4.3E-01
			Zinc	NA	NA	NA	0.0E+00	Blood	8.1E-02	NA	1.1E-04	8.1E-02
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		1.6E+01	0.0E+00	4.5E-01	1.6E+01
		Exposure Point Total					0.0E+00					1.6E+01
	Exposure Medium Total						0.0E+00					1.6E+01
Medium Total							0.0E+00					1.6E+01
Receptor Total							0.0E+00				Receptor HI Total	1.6E+01

HI - Hazard Index
CNS - Central Nervous System
NA - Not Applicable

Total CNS HI Across All Media =	6.9E+00
Total Longeviety HI Across All Media =	1.6E-01
Total Blood Glucose and Cholesterol HI Across All Media =	1.6E-01
Total Skin HI Across All Media=	1.9E+00
Total Vascular HI Across All Media =	1.9E+00
Total Kidney HI Across All Media =	7.3E-01
Total Small Instestine HI Across All Media =	1.3E-01
Total Gastrointestinal HI Across All Media =	6.1E+00
Total Liver HI Across All Media =	9.2E-01
Total Blood HI Across All Media =	1.1E+00
Total Hair HI Across All Media =	9.2E-01

TABLE 9.1.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

SITE 5, ST. JULIENS CREEK ANNEX, CHESAPEAKE, VIRGINIA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
											Total Body Weight HI Across All Media =	2.0E-01

TABLE 9.2.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SITE 5, ST. JULIENS CREEK ANNEX, CHESAPEAKE, VIRGINIA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer - Tap Water	Aluminum	NA	NA	NA	0.0E+00	CNS	NA	NA	NA	0.0E+00
			Antimony	NA	NA	NA	0.0E+00	Longeviety, Blood Glocose and Cholesterol	NA	NA	NA	0.0E+00
			Arsenic	2.4E-04	NA	2.2E-11	2.4E-04	Skin, Vascular	NA	NA	NA	0.0E+00
			Barium	NA	NA	NA	0.0E+00	Kidney	NA	NA	NA	0.0E+00
			Beryllium	NA	NA	NA	0.0E+00	Small Intestines	NA	NA	NA	0.0E+00
			Cadmium	NA	NA	NA	0.0E+00	Kidney	NA	NA	NA	0.0E+00
			Chromium (total)	NA	NA	NA	0.0E+00	Gastrointestinal	NA	NA	NA	0.0E+00
			Cobalt	NA	NA	NA	0.0E+00	Blood	NA	NA	NA	0.0E+00
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	NA	NA	NA	0.0E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	NA	NA	NA	0.0E+00
			Nickel	NA	NA	NA	0.0E+00	Decreased Body and Organ Weights	NA	NA	NA	0.0E+00
			Thallium	NA	NA	NA	0.0E+00	Skin, Vascular, Liver, Blood, Hair	NA	NA	NA	0.0E+00
			Vanadium	NA	NA	NA	0.0E+00	Kidney	NA	NA	NA	0.0E+00
			Zinc	NA	NA	NA	0.0E+00	Blood	NA	NA	NA	0.0E+00
			Chemical Total	2.4E-04	0.0E+00	2.2E-11	2.4E-04		0.0E+00	0.0E+00	0.0E+00	0.0E+00
		Exposure Point Total					2.4E-04					0.0E+00
	Exposure Medium Total						2.4E-04					0.0E+00
Medium Total							2.4E-04					0.0E+00
Receptor Total							2.4E-04				Receptor HI Total	0.0E+00

HI - Hazard Index
CNS - Central Nervous System
NA - Not Applicable

TABLE 9.2.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
SITE 5, ST. JULIENS CREEK ANNEX, CHESAPEAKE, VIRGINIA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer - Tap Water	Aluminum	NA	NA	NA	0.0E+00	CNS	NA	NA	NA	0.0E+00
			Antimony	NA	NA	NA	0.0E+00	Longeviety, Blood Glocose and Cholesterol	NA	NA	NA	0.0E+00
			Arsenic	5.4E-05	NA	1.3E-07	5.4E-05	Skin, Vascular	NA	NA	NA	0.0E+00
			Barium	NA	NA	NA	0.0E+00	Kidney	NA	NA	NA	0.0E+00
			Beryllium	NA	NA	NA	0.0E+00	Small Intestines	NA	NA	NA	0.0E+00
			Cadmium	NA	NA	NA	0.0E+00	Kidney	NA	NA	NA	0.0E+00
			Chromium (total)	NA	NA	NA	0.0E+00	Gastrointestinal	NA	NA	NA	0.0E+00
			Cobalt	NA	NA	NA	0.0E+00	Blood	NA	NA	NA	0.0E+00
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	NA	NA	NA	0.0E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	NA	NA	NA	0.0E+00
			Nickel	NA	NA	NA	0.0E+00	Decreased Body and Organ Weights	NA	NA	NA	0.0E+00
			Thallium	NA	NA	NA	0.0E+00	Skin, Vascular, Liver, Blood, Hair	NA	NA	NA	0.0E+00
			Vanadium	NA	NA	NA	0.0E+00	Kidney	NA	NA	NA	0.0E+00
			Zinc	NA	NA	NA	0.0E+00	Blood	NA	NA	NA	0.0E+00
			Chemical Total	5.4E-05	0.0E+00	1.3E-07	5.4E-05		0.0E+00	0.0E+00	0.0E+00	0.0E+00
		Exposure Point Total					5.4E-05					0.0E+00
	Exposure Medium Total						5.4E-05					0.0E+00
Medium Total							5.4E-05					0.0E+00
Receptor Total							5.4E-05				Receptor HI Total	0.0E+00

HI - Hazard Index
CNS - Central Nervous System
NA - Not Applicable

TABLE 10.1.RME

RISK SUMMARY

REASONABLE MAXIMUM EXPOSURE

SITE 5, ST. JULIENS CREEK ANNEX, CHESAPEAKE, VIRGINIA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer - Tap Water	Aluminum	NA	NA	NA	0.0E+00	CNS	3.1E+00	NA	2.1E-02	3.1E+00
			Antimony	NA	NA	NA	0.0E+00	Longeviety, Blood Glocose and Cholesterol	5.0E-01	NA	2.2E-02	5.2E-01
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	2.3E+00	NA	1.5E-02	2.3E+00
			Barium	NA	NA	NA	0.0E+00	Kidney	1.7E-01	NA	1.6E-02	1.8E-01
			Beryllium	NA	NA	NA	0.0E+00	Small Intestines	4.2E-01	NA	4.0E-01	8.2E-01
			Cadmium	NA	NA	NA	0.0E+00	Kidney	1.4E+00	NA	1.9E-01	1.6E+00
			Chromium (total)	NA	NA	NA	0.0E+00	Gastrointestinal	3.9E-01	NA	2.1E-01	6.0E-01
			Cobalt	NA	NA	NA	0.0E+00	Blood, Skin	4.3E-01	NA	2.9E-03	4.4E-01
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	1.1E+01	NA	7.6E-02	1.2E+01
			Manganese	NA	NA	NA	0.0E+00	CNS	1.4E+01	NA	2.3E+00	1.6E+01
			Nickel	NA	NA	NA	0.0E+00	Decreased Body and Organ Weights	7.8E-01	NA	1.3E-01	9.1E-01
			Thallium	NA	NA	NA	0.0E+00	Skin, Vascular, Liver, Blood, Hair	1.9E+00		2.5E-03	1.9E+00
			Vanadium	NA	NA	NA	0.0E+00	Kidney	1.8E+00	NA	4.5E-01	2.2E+00
			Zinc	NA	NA	NA	0.0E+00	Blood	4.3E-01	NA	1.7E-03	4.3E-01
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		3.9E+01	0.0E+00	3.8E+00	4.3E+01
		Exposure Point Total					0.0E+00					4.3E+01
	Exposure Medium Total						0.0E+00					4.3E+01
Medium Total							0.0E+00					4.3E+01
Receptor Total							0.0E+00				Receptor HI Total	4.3E+01

HI - Hazard Index

CNS - Central Nervous System

NA - Not Applicable

Total CNS HI Across All Media =	1.9E+01
Total Longeviety HI Across All Media =	5.2E-01
Total Blood Glucose and Cholesterol HI Across All Media =	5.2E-01
Total Skin HI Across All Media=	4.6E+00
Total Vascular HI Across All Media =	4.2E+00
Total Kidney HI Across All Media =	4.0E+00
Total Small Instestine HI Across All Media =	8.2E-01
Total Gastrointestinal HI Across All Media =	1.2E+01
Total Liver HI Across All Media =	1.9E+00
Total Blood HI Across All Media =	4.7E+00
Total Hair HI Across All Media =	1.9E+00
Total Body Weight HI Across All Media =	9.1E-01

TABLE 10.1.CTE
RISK SUMMARY
CENTRAL TENDENCY EXPOSURE
SITE 5, ST. JULIENS CREEK ANNEX, CHESAPEAKE, VIRGINIA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer - Tap Water	Aluminum	NA	NA	NA	0.0E+00	CNS	6.8E-01	NA	1.5E-03	6.9E-01
			Antimony	NA	NA	NA	0.0E+00	Longeviety, Blood Glocose and Cholesterol	1.6E-01	NA	2.3E-03	1.6E-01
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	9.6E-01	NA	2.1E-03	9.7E-01
			Beryllium	NA	NA	NA	0.0E+00	Small Intestines	1.0E-01	NA	3.2E-02	1.3E-01
			Cadmium	NA	NA	NA	0.0E+00	Kidney	2.3E-01	NA	1.0E-02	2.4E-01
			Chromium (total)	NA	NA	NA	0.0E+00	Gastrointestinal	1.2E-01	NA	2.1E-02	1.4E-01
			Cobalt	NA	NA	NA	0.0E+00	Blood	1.2E-01	NA	2.7E-04	1.2E-01
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	5.9E+00	NA	1.3E-02	5.9E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	5.9E+00	NA	3.2E-01	6.2E+00
			Nickel	NA	NA	NA	0.0E+00	Decreased Body and Organ Weights	1.9E-01	NA	1.0E-02	2.0E-01
			Thallium	NA	NA	NA	0.0E+00	Skin, Vascular, Liver, Blood, Hair	9.2E-01	NA	4.0E-04	9.2E-01
			Vanadium	NA	NA	NA	0.0E+00	Kidney	4.0E-01	NA	3.4E-02	4.3E-01
			Zinc	NA	NA	NA	0.0E+00	Blood	8.1E-02	NA	1.1E-04	8.1E-02
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		1.6E+01	0.0E+00	4.5E-01	1.6E+01
		Exposure Point Total					0.0E+00					1.6E+01
	Exposure Medium Total						0.0E+00					1.6E+01
Medium Total							0.0E+00					1.6E+01
Receptor Total							0.0E+00				Receptor HI Total	1.6E+01

HI - Hazard Index
CNS - Central Nervous System
NA - Not Applicable

Total CNS HI Across All Media =	6.9E+00
Total Longeviety HI Across All Media =	1.6E-01
Total Blood Glucose and Cholesterol HI Across All Media =	1.6E-01
Total Skin HI Across All Media=	1.9E+00
Total Vascular HI Across All Media =	1.9E+00
Total Kidney HI Across All Media =	6.8E-01
Total Small Instestine HI Across All Media =	1.3E-01
Total Gastrointestinal HI Across All Media =	6.1E+00
Total Body Weight HI Across All Media =	2.0E-01
Total Organ Weight HI Across All Media =	2.0E-01
Total Blood HI Across All Media =	1.1E+00

TABLE 10.2.RME
RISK SUMMARY
REASONABLE MAXIMUM EXPOSURE
SITE 5, ST. JULIENS CREEK ANNEX, CHESAPEAKE, VIRGINIA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult/Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
		Shallow Aquifer - Tap Water	Arsenic	2.4E-04	NA	NA	2.4E-04		NA	NA	NA	0.0E+00
			Chemical Total	2.2E-11	0.0E+00	0.0E+00	2.4E-04		0.0E+00	0.0E+00	0.0E+00	0.0E+00
		Exposure Point Total					2.4E-04					0.0E+00
	Exposure Medium Total						2.4E-04					0.0E+00
Medium Total							2.4E-04					0.0E+00
Receptor Total							2.4E-04				Receptor HI Total	0.0E+00

TABLE 10.2.CT

RISK SUMMARY

CENTRAL TENDENCY EXPOSURE

SITE 5, ST. JULIENS CREEK ANNEX, CHESAPEAKE, VIRGINIA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult/Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
		Shallow Aquifer - Tap Water	Arsenic	5.4E-05	NA	1.3E-07	5.4E-05		NA	NA	NA	0.0E+00
			Chemical Total	5.4E-05	0.0E+00	1.3E-07	5.4E-05		0.0E+00	0.0E+00	0.0E+00	0.0E+00
		Exposure Point Total					5.4E-05					0.0E+00
	Exposure Medium Total						5.4E-05					0.0E+00
Medium Total							5.4E-05					0.0E+00
Receptor Total							5.4E-05				Receptor HI Total	0.0E+00